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EDITORIAL NOTES.

The Outlook.

WE do not desire readers to imagine that we are taking a pessimistic view of the immediate future of the gas industry; but it is impossible to get away from the fact that the closer inspection is made, the more apparent is it that, in the general pressure of current circumstances, the gas industry is coming in for its full share, and there will be no escaping the necessity for distributing the results (in order to make them as light as possible, over the whole body of gas consumers. The serious fact has to be faced that the next coal contracts will have to be at a higher price than the present ones. It was seen last week that Sir Arthur Markham had stated in the House of Commons that the increased costs of production owing to war conditions is represented by from 1s. 6d. to 2s. We can at any rate accept this estimate as being approximately correct, though as the consistent apologist of colliery owners—the "Iron and Coal Trades Review"—says, the estimate is by no means generally accepted by the colliery owners. This is not surprising; and no one expects them to agree with it. Such a concession from the general run of colliery owners, in face of the recent history of the big increases in coal prices and their attributed causes, would come with an uncomfortably startling force upon the community. Certain facts can be accepted by commonsense and independent folk. One is that Sir Arthur is a large colliery owner; he is not one of those who, as Sir Corbet Woodall put it at the Croydon Gas Company's meeting on Friday, have done the "unpatriotic thing of making special "war profits during the prevalence of war." We have also to accept the fact that Sir Arthur is a considerable colliery owner; and therefore not even the "Review" can dispute that he is in a position to speak with authority. We cannot see the slightest reason why an untruth on this subject, which would be diametrically opposed to his own interests as a colliery owner, should fall from the lips of Sir Arthur. But, unfortunately for our contemporary, its negation of the general accuracy of the estimate is not accompanied by any actual figures demonstrating, by an analysis of the total, that the high prices for coal now ruling in certain quarters and those menaced, are justified.

It will likely be remembered that Sir Arthur urged the Government to stay the imposition of excessive coal profits by placing upon coal maximum prices. Whether the Government will do this if the greed of the coalowners does not abate is not known; but the Brodsworth group of collieries in which Sir Arthur is so closely interested have put into practice what he suggested. From these collieries no description of coal is to be sold at a price exceeding 15s. per ton. The Directors, in making this announcement, remark that no advantage should be taken by any industry whatever to inflict unnecessarily additional cost upon the community; and they hope that other colliery owners will fall into line, with the view of assisting the country at a time of great national crisis. Experience does not help to fill us with any great expectation that other colliery owners will follow the example. But when an important Board of Directors such as that of the Brodsworth Main Colliery Company take such a step, and make such an appeal, the published defensive b'eatings on behalf of the high profit grabbers sound, in contrast, very weak. We should prefer a better cause to defend than the unpatriotic one of making through avarice the burdens of the country heavier than they are.

However, the estimate of 1s. 6d. to 2s. as the increase in working expenses is a guide to the certainty that something additional will be required from gas undertakings next contract season; and "feelers" that have already been made confirm it. Various figures are spoken of as being the likely measure of increase under coming contracts; but it is too early yet to mention anything very definitely. It may, however, be said that one contract has been settled for Durham coal at an advance of 2s.; another for Yorkshire coal at from 4s. to 5s. increase on the somewhat (as things went) low figures of the last contracts. In a further instance, an offer of Durham coal has been made at an advance of 3s. It is to be hoped the Government Committee who have started to inquire into the subject of the grievous rise in the price of household coal will be prompt about their work, and advise the Government what steps should be taken to bring to an end the wicked extortion there has been, particularly in the case of poor purchasers in small quantities. If the Government take repressive action in this direction, it may react beneficially upon other classes of coal. Meanwhile, oil has also advanced in price. From this, it is seen that the current year cannot possibly be contemplated as going to give an improvement in the way of a reduction of producing costs to help to relieve the general pressure that there is upon gas undertakings. Particularly will this be the case with those concerns at a distance from the coal-fields, and those whose coal is seaborne. Already the increase in the cost of production has been heavy. Croydon is an example of a Company depending on dual conveyance of coal by sea and rail; and some interesting figures bearing upon recent productive expenses in their case were quoted by Mr. Charles Hussey, in his address to the proprietors last Friday. But the increases quoted by him are not, we fear, the maximum that must be expected.

Looking round—apart from the raw materials required by gas undertakings—it is seen that last week freightage from the Tyne to London was put up to 17s. 6d. per ton, which was perfectly monstrous. Even the Government could not tolerate that; and they quoted for enemy ships—not constructed for quick coal reception and discharge—13s. per ton as the maximum rate. Protest against this caused another 1s. to be shed. The 12s. is still monstrous. Then, to make matters worse, the Port of London Authority, in view of the increase in wages and other expenditure, have resolved that "all dock dues and other charges on vessels and "lighters, and all dock and warehouse rates, charges, and "rent on goods, from March 8, will be increased by 7½ per "cent." The Manchester Ship Canal Company are also making percentage increases—in rates and dues by 10 per cent., rates for charging and loading vessels by 20 per cent., and rent charges by 10 per cent. Upon the increased costs of coal, freightages, and dues, comes the consideration that is being paid by the directors of some gas undertakings to the question of relief for their men from the effects of the higher prices of food and other necessaries during the war. It must be conceded that prior to the war the rates of wages in the gas industry were, according to geographical location, generally on a good scale. What is now being done by some boards of directors is to grant relief by a special bonus, graduated downwards according to the height of the rate of wages, to be continued during war time or during the prevalence of high food prices.

From even a cursory review of prospects in regard to the added costs of carrying on the business of gas supply during war time, one does not rise with any feelings that are bright. To set against these increased costs, there is only the current excellent demand for coke, and the better prices that are being obtained for it and for sulphate of ammonia. There is no help for it; there must be a distribution of at any rate some share of the additional costs among consumers. But unlike the coal and ship owners, gas undertakings will not make the necessity for extra revenue an excuse for extracting from the consumers a superprofit. There is every confidence that, after the war, gas undertakings will return to normal trading conditions, and then the consumers will, with the consummation of this expectation, share by a reduced price in the results of the better circumstances.

Providing for Rainy Days, and Other Current Topics.

Among the incidental effects of the war has been the continuance in office for a second year of certain of the Presidents of organizations of the gas industry. Mr. J. G. Newbigging is one of these Presidents, and the Manchester District Institution the organization. But unlike the President of the Institution of Gas Engineers and of the British Commercial Gas Association, his occupancy of the office for two years has meant the preparation of a second presidential address. This, however, was no particular hardship; and the result is of peculiar interest. The second address (which was delivered last Saturday) has two distinct parts. In the one the President, with his usual broad observation, treats of the influences of the war upon the gas industry, and draws certain lessons from the position. In the second part, he deals with more permanent questions affecting the future of the industry and its technic. We need not dwell here upon the disagreeable incidences of the war on the commercial interests of the gas industry taken as a whole—"as a whole," because some concerns in industrial areas have been beneficially affected by the demands made upon the factories by the war and the cessation of imports from Germany and Austria. The ill-effects are too well known, and the beneficial ones have (where their incidence has been experienced) been received with open arms, and are appreciated at their full worth.

One lesson to be drawn from the present conditions is expressed by Mr. Newbigging in a happy phrase—that is, "the "necessity of adequately providing for a rainy day." The necessity presses in more ways than one. War effects suggest that an excellent revision of policy on the part of many gas undertakings would be in "taking more thought for the "morrow." War, thank goodness, like the present has no precedent, and is not likely—at any rate, it is hoped not—to have a similar succeedant. But the history of recent times, and that now in the making, urge the prudence of not leaving things to chance. The first lesson drawn by Mr. Newbigging from current circumstances is the need for good stocks of raw material. This was generally recognized after the coal strike of 1912; and it was then also recognized that the new policy of national labour strikes made it an essential of administrative policy that stocks should be permanently larger than heretofore. But familiarity with times of comparative peace seems soon to have a reactive influence upon good resolutions made while the pinch is being felt. The war and coal delivery troubles have found several gas-works short of adequate stocks. Even the managers of works that started the past winter with heavy stocks have seen an inordinate part of them vanish daily; and gloomy anxiety over deliveries has lately been a very constant companion. There is not only the present, but the future. "A serious "menace confronts us next year," says the President. Optimists assert that the war cannot last much longer; but such optimism has a very insecure foundation. Even Lord Kitchener declines to measure the duration of the conflict by years, let alone by months. The responsibility of gas suppliers therefore claims from them not an optimism that may be altogether broken down by events, but a prompt move to legislate for the worst possible conditions that may befall next winter in regard to the scarcity of coal and the difficulty of delivery; and the most must be made of the lengthening days and the warmer and summer months to get in as heavy stocks as possible. It is no good trusting to anything in view of present unparalleled conditions and a future veiled by uncertainty as closely and densely as it possibly can be. The soundness of the policy in this regard will be best admitted not by mere words, but by deliberate action by gas administrators taking advantage of opportunities afforded by the lessened demands for coal at the close of winter, of the improvement in railway facilities, and of the running of more steamers, with freightage (it is hoped) considerably diminished from the present exorbitant figures.

The second lesson drawn by Mr. Newbigging from the present conditions is the necessity on the part of some gas undertakings for making larger financial provision for rainy days than has been their wont, so as to obviate raising the price of gas, unless absolutely compelled to do so. It seems to be an unavoidable flaw in the conduct of mundane affairs that, when there is great pressure upon the individual's purse for national requirements, coincidently nearly every commodity the individual requires increases in price, and so makes the demands upon him or her weightier still. It may with truth be said that provision against such conditions is a matter of individual responsibility. Unfortunately with the bulk of the population, such provision is a perennial impossibility. But alike with individuals and with industrial and trading concerns when peace and prosperity obtain, it is, where the possibility exists, an obligation to make compensatory provision for the times when national needs or some other untoward circumstances exert the most poignant pressure. This applies to gas undertakings. The President urges the responsibility upon the part of their administrations for making good reserves, so as to avoid, as far as possible, the raising of prices to consumers. Few gas undertakings, it is to be feared, will be able to go through the present national crisis without advancing the price of gas; but those with the best reserves proportionate to their size are those that will be able to go the farthest without taking this step, and, when or if taken, the increase will be the lightest in amount. The President has no belief, in the case of municipal concerns, in the suspension of annual sinking-fund payments for the purpose of obviating an advance in price; we were under the impression that the idea of such suspension was to provide money for necessary and profitable capital expenditure, so as to help to keep the nation's industrial wheels in motion. However, every municipal authority that advances the price of gas at this time, in order to get a full contribution of "profit" in aid of the rates, instead of spreading the sum equitably over the larger area provided by the whole body of ratepayers, will be doing a gross injustice to the section of the ratepayers who are gas consumers. Municipalities have practically a free hand (and they ought voluntarily to take advantage of it) in "putting-by" for rainy days. Gas companies are restricted. But the restrictions give fairly adequate provision; for few indeed are the companies who, under normal circumstances, work up reserves to their ultimate bounds. Those concerns with good reserves are those that possess the greatest elasticity. We like the importation by the President into gas policy of "elasticity" as a principle that should be adopted—"elasticity" obtained by good reserves, including a renewals fund to be built up year by year on a depreciation basis. Only by attention to this important matter is the essential elasticity provided which enables a gas undertaking to bridge-over temporary difficulties.

A topic with relation to the foregoing is that of the right attitude to adopt in the present circumstances in regard to extensions or reconstruction work; and Mr. Newbigging, as might have been expected, is in favour of the policy of "business as usual," save in those cases where work can be postponed indefinitely without material injury. His Committee and himself have put their views into practice by entering upon the construction of a large carbonizing plant on the vertical retort system. But those managements that can only delay constructional work for a year or two might (as we were pointing out recently) just as well, and, in fact, better, proceed with it at once. The costs of materials are ascending, and so is the price of labour. These are not likely to be temporary conditions; for the devastation caused by war and the wastage of national armaments will, for years following the war, lay claim through their replacement upon this country. In such circumstances, there will be no value in procrastination; but there may be loss.

Leaving these general topics, which have a necessary, but not agreeable, predominancy just now, for others of more permanent importance, there is the matter of the calorific value standard. While agreeing that for standard purposes there is, excepting composition, no better criterion than calorific power, the President admits that the time is not ripe for instituting a standard of composition. It would be necessary to get gas-producing plant thoroughly reorganized before such a revolution in standard requirement could be made. Some day, it may be, the value of gas will be measured by fixing the maximum allowable incombustibles; but we do not want to see any more statutory regulation imposed upon the gas industry. If, however, the regulation of the incombustibles ever does come, it will be due entirely to those inconsiderate (a harsher term could be used) managements who send out gas containing an inordinately large percentage of inert constituents. At the same time, a fairly constant composition is an advantage to the consumer and a protection to the commercial position of the suppliers. Regulation in this respect, however, would be irksome in times of labour or other disturbances and when, through adventitious circumstances, normal routine is interfered with. Mr. Newbigging in a table shows how slight

differences in retort conditions will tell on gas composition and calorific power, and therefore how there is value in having regular analyses serving as a guard to the conditions that will give the best result. Examine the last two columns of the table, and compare the figures in the section where the gauge shows only 1-10th inch pressure with the groups of figures under other conditions. It is remarked that the President fails to see the soundness of the argument for (in cases) a different calorific standard for different districts—even though, we take it, an economic advantage is to be found in the use of local coal which may not be capable, making the best of the coal, of producing with any degree of certainty gas of approximately the ordinary standard. It is considered by Mr. Newbigging that this contention is outweighed by the value of a national standard, in view of the assistance this would render in standardizing gas-consuming appliances. We are not prepared to go the length of suggesting the adoption of a low calorific power standard which would be impracticable from all common-sense points of view. But we have not yet found from experiment that any calorific power difference within the range that since 1912 has been adopted in the Committee rooms has any substantial prejudicial effect when the gas is used in modern appliances ; and therefore, within the limits of those differences, standardization work or appliances will not be in any way affected. There are other variations that have greater influence.

Among other subjects discussed in the address were the conservation of ammonia and the quality of sulphate of ammonia. The excellent results that ensued from making upon the gas-works at Manchester studied protection of the ammonia, as related in the address delivered a year ago, have continued to provide full justification for pursuing the work. The quality of sulphate is a present point of importance. Agreeing with the Sulphate of Ammonia Association's prescription as to the moisture and free acid content of production, Mr. Newbigging is not so sure that it is necessary to make sulphate of the quality of 24¾ to 25 per cent. ammonia, and that 24 to 24½ per cent. quality is as good a marketable commodity, seeing that the purity of the acid required for the higher testing sulphate of ammonia considerably increases the cost of manufacture, while the lower producing cost of the 24 per cent. enables it to be sold at a lower figure. There is something in the argument; but it is not the whole argument. Most of the coke-oven production, and the German output (including the synthetic make), are up to the 25 per cent. standard; and it must not be forgotten that, prior to the war, the 25 per cent. material was being offered abroad at a lower figure than our 24 per cent. make, and was supplanting the latter. In this competition of the higher standard material, the British makers are not the only people with a voice as to the question of quality. We have to dispose of the major part of the British make a distance across the seas ; and the customers there, with the offers of this and that country before them, have also a voice in the question of quality. They ask for the 25 per cent. quality, and what is more they will have it, if it is available.

At the end of the address, Mr. Newbigging mentions the cases which have proved the existence of illegal and uncommercial practices in the electricity supply industry in connection with the charges made for current. There is obvious feeling on the part of the President when he protests against the secret and private bargaining that so frequently accompanies electricity supply, and which method of business is the best possible proof that what is being done is of an indefensible character when tested by applicable commercial principles. The real object in view in this secrecy is perfectly patent, except to innocents and the purblind. An unpleasant feature of these illegal or uncommercial tactics as developed by electrical "Kultur," is that they preceded German submarine warfare and indiscriminate mining. In his address a year since, the President suggested the joint commercial management of gas and electricity concerns under municipal direction, leaving the technical work associated with the provision of both commodities wholly independent. But this proposal was acutely criticized, and no one was prepared to accept it. Now it is suggested, as an alternative, that to "the finance committee or some other special committee should be relegated the duty of seeing that the "charges for both gas and electricity are in order, and that "full schedules of such charges should be published for "the information of consumers." There would be great ferocity shown by the electricity industry in resisting the latter fair proposal. As to the former, we have not so far come across members of municipal committees who understand anything of the bases of electrical charges, and we are quite confident that, when in certain cases it is seen what a load of charges prices being a fraction of a penny per unit have to bear, the responsible electrical engineers could not defend them by the application of any known and approved commercial principles.

"Total Heat."

THERE is one part of Mr. Newbigging's references to the calorific power question which should be separately mentioned. It is the part where he questions the superiority of a form of total heat calorimeter over what has hitherto been the standard instrument—that is to say, the Boys. It will be specially observed that the President does not deny the right of gas suppliers to the principle of having their gas adjudged for its total heat value. He says, in selecting a calorimeter, it behoves the engineer to have one which, in addition to being correct, is so constructed that the sources of error are few, is easy of manipulation, and is capable of returning the "maximum value" obtainable from the gas. "Maximum value" is the same thing as total heat. Therefore, quite irrespective of the instrument to be used, no gas company or other authority going to Parliament for a calorific power standard should neglect to definitely ask for the right to "total heat"—the same as the Gas Light and Coke, the Liverpool, and other companies last session. If—the "if" may be emphasized—the instrument is not yet available which will give a gas full credit for its heat value, gas companies and other authorities may as well be, through the prescription of "total "heat" in their calorific standard clauses, in a position to take advantage of such an instrument when it does arrive. Mr. Newbigging's experience with the form of total heat calorimeter referred to has not so far been favourable in comparison with the Boys' standard instrument, which has not professed to return the "total heat" value of the gas. The Manchester experience, however, is not commonly confirmed. It is, to say the least, rather a singular thing that an instrument not expressly designed to give the total heat value should show a higher return than one that has been specially devised for the purpose ; and there is greater surprise when it is known that the Boys instrument has been undergoing structural supplement lately with a view to securing with it maximum heat value. If Mr. Newbigging is getting a higher heat value for his gas with an old type Boys calorimeter than from the other one, then the former is giving him nearer the "total heat" value of the gas than the latter. Under the circumstances, he should jealously preserve the old type Boys calorimeter, inasmuch as he may hereafter find it will serve him better than even the Boys instrument supplemented with the object of securing maximum heat value. The day may come when an Act of Parliament applying to the Manchester Gas Department will state that the gas shall be so tested as to secure the total heat value ; and the Boys instrument now in possession of the department may then be a useful servant over and above all other members of the same genus. It does not matter to us what type of calorimeter is used, so long as it is an instrument which will give total heat value to the gas tested. What will soon be required is a thorough investigation not by one but by several competent and independent authorities to put beyond all manner of doubt the question as to which is the calorimeter that most truly performs the function required of it—that is to say, gives the gas credit for its full heat value.

The Case for the Jib Crane on Gantry.

TECHNICAL opinion seems to have pretty generally moulded itself into a preference for the telpher system in connection with coke handling. It is indeed rather remarkable how the system has grown in appreciation, to the detriment of the former possessor of the field—the hot-coke conveyor. But one has only to consider the drawbacks of the hot-coke conveyor to appreciate the cause of the welcome extended to another system which eliminated some, at any rate, of these disadvantages. But, as a competitor of the telpher, there has been little consideration given to the use of the steam jib crane run on a gantry. The case in favour of this system has been framed by Mr. R. E. Gibson, of Liverpool, in a paper which he read before the Manchester Institution

last Saturday; and very good advocacy he made for it· while acknowledging that, as in the case of the other systems of coke handling, it has its individual limitations—one being that it is not practicable to take crane and gantry into any retort-house, and pick up skips of coke from the discharge side of the bench. The telpher suffers the same disability with vertical (but not horizontal) retort installations. Where, however, there is the will, there is the way of meeting this in order to gain ultimate advantage in costs and working efficiency. Mr. Gibson states the case both for and against the steam jib crane and gantry, the telpher, the Temperley transporter, and the hot-coke conveyor; but to adequately discuss the merits and demerits of each system here would require as much space as is devoted to the useful paper itself. Let it be said, however, the jib crane and gantry scores all along the line. But it does not, in our opinion, offer the same flexibility as the mono-rail telpher in penetrating different parts of a works, for not only stacking and loading purposes, but for feeding water-gas plant and for supplying the coke for the first recharging of continuous vertical retorts after they have been out of action for a time. But opposed to this, the stacking field is greater with the jib crane running on a gantry than is the case with any other system. This advantage would have been greatly appreciated by many gas engineers a few months ago; but they want to have little future experience of the need for the advantage. Regarding the comparative figures that Mr. Gibson gives in his tables, we have no doubt that some of them would be considerably modified by the conditions on other works. As a matter of fact, he has tried to level-up comparison with the four systems to the maximum working capacity, which is an ideal condition that is not realizable on many works. However, looking at the tables, in capital cost, in capital cost per ton per hour, in power and efficiency, and in interest, depreciation, maintenance, renewals, power, and working costs per ton, the jib crane and gantry come out on top. What happens to the other systems can be seen from the tables; but within the limits of these data, without taking into account other considerations, the hot-coke conveyor does not look so bad as might have been expected in comparison with the telpher and the transporter systems. The paper is one that is bound to lead to a good deal of study, in the light of experiences and working records on other works.

Maintenance of Burners and Other Appliances.

If it has been said once, it has been said a dozen times or more in the "Journal" that the authors of papers who bring forward by discussion the subject of the maintenance of gas-burners and other appliances do good service. Mr. H. Kendrick performed this service at the meeting of the Manchester Institution on Saturday; and it is hoped that his paper then secured converts, and will further do so by publication, from a policy of suicidal neglect to one of protective importance. Mr. Kendrick does not claim that what he has to say is new as a policy; but it is a statement as to his convictions and experiences, and ascertained benefits. His ideal in this maintenance business is the systematic inspection, cleaning, and keeping in a state of efficiency of every gas-consuming appliance in a district; but he knows that this ideal is not to be attained by the stroke of the pen, or by the mere passing of a resolution by a board of gas directors or the members of a gas committee. It is a system that must be worked up gradually and methodically, and not be dabbled in, as is the manner of some gas undertakings, in a spasmodic, negligent sort of way. Above all things there is great necessity for control over gas-burners. There is no doubt that many consumers of gas for lighting purposes have been lost to gas undertakings owing to neglected burners; and it is equally certain that to many gas undertakings there has been considerable monetary loss through ignored depreciation, owing to the absence of any periodical inspection and maintenance (on systematic lines) of cookers, grillers, and gas appliances, which loss would have been much better expended enhancing the satisfaction of consumers. The whole question of maintenance is nothing more or less than an economic and protective one.

The matter, Mr. Kendrick says, rests in the hands of those responsible for the policy and working of gas undertakings, which is true. But, save in the case of appliances on hire, a difficulty is that one cannot compel consumers to allow inspection and maintenance of their private gas possessions—whether burners or other appliances. Compulsion, in fact, would be fatal to the continuance of some gas accounts. The only way in which a maintenance system can possibly be firmly established and expanded is by the efficiency of service advertising it, and creating the desire on the part of consumers to participate in its benefits. But maintenance costs money; and this is the obstacle in the pathway of some shortsighted administrative bodies. This, however, is the point at which Mr. Kendrick's scheme of a gradual development enters. By starting a small maintenance department, and gradually developing its services, the expense over and above the revenue properly assignable to it will not assume such serious proportions as if the total ultimate cost were presented right away at the introduction of the scheme. Of this we are perfectly convinced, that fixed charges for maintenance will never result in universal maintenance. The system adopted by Mr. Kendrick, and which pays him, is free inspection of burners and other appliances, and a charge only for the materials used. In equity there must be a charge for material. So far as the cost of inspection and maintenance of appliances on hire is concerned, the hiring rates must include this cost, which should be placed to the credit of the special maintenance department. As to burner inspection and maintenance (other than cost of materials), it is good policy to have say 1d. in the price of gas which can be allocated to, and spent in, rendering the service rather than making a fixed charge for it. We know that, strictly speaking, this may not work out with fairness in all cases; but generally there will not be much of which any consumer can complain. Unfairness in the case of heavy consumers can be wiped out in the discount for large consumption, and which discount is always acceptable. Some of the consumer's pence earmarked for inspection and maintenance purposes would go towards counterbalancing the discount.

The most pronounced economic advantage of maintenance is the protection it affords to business; and while one cannot assign a value to it in £ *s. d.*, it is there. In one part of his paper, Mr. Kendrick also shows that the details of a maintenance scheme must be carefully worked out in order that outlay, while not stinted for what is essential, may not be wasted. There is example in one detail. In the inspection of lighting burners, six visits per annum (instead of twelve) are now found to suffice; and the interval between the visits is greater in summer than in winter. The figures in the paper indicate that this has materially brought down the costs per burner. The matter of maintenance is one which it is worth while looking into very carefully. In our opinion, it is an essential part of the general policy of a gas undertaking in these days of keen competition.

Science v. Superstition.

Mr. Ernest Linder is out for information. He wants to know [see our "Correspondence" columns] whether any of our readers are acquainted with what appears to be a widely-prevalent belief, especially among the working classes, that wet coke burns better than dry, with a brighter glow, and lessened evolution of sulphur fumes. Research into the origin and the wherefore of things is part of Mr. Linder's nature and training; and so we hope that, if any of our readers can gratify his desire for information on the point in question, they will do so. Science and erroneous belief happen to have clashed within the limits of a few hours in the experiences of our correspondent's life. He reads in the "Journal" (and what he reads there is supported by his own knowledge of chemical and physical matters) that moisture in coke is detrimental to its heating value, and therefore to the consumer—to the consumer in a double sense, as he not only loses the heat represented by the weight of carbon displaced by the moisture in making a purchase, as well as the heat expended to drive off the moisture, but he has to pay the same price for the water as he would have to do for the equivalent weight of carbon if the coke were dry. Almost simultaneously with his reading of this in the "Journal," Mr. Linder finds himself, as a special constable, in company with a man who is a gardener, who believes that the coke fire in a brazier—with which the comrades (with little in common but a desire to help in the country's service) try to add to their personal comfort during the nocturnal hours of watching—would be improved in brightness by a shovelful of snow. The result is described in the letter elsewhere. We confess we have not heard of the existence of the idea that the damping of coke enhances the brilliance of a fire. But Mr. Linder says it is "widespread

and sincerely held." Had he not made this remark, we should have asked whether it is not possible the notion has developed from the damping of fires not originally with a view of brightening, but of conserving, them. The writer of this note remembers well that his grandfather in the seventies, in banking-up his greenhouse fire for the night, always put on top a good layer of wet breeze, which naturally caused slow combustion by choking (so to speak) the draught through the fire. In the setting up of a poker in front of a fire, there was perhaps a little more sense—though not much—than in damping the fuel. The idea, we believe, was that by further splitting-up the air supply with the poker, the draught to and through the fire was accelerated. We have not troubled to test the matter, and have just about as much faith in it as in the moistening of coke to promote its incandescence.

The Aniline Dye Scheme in the Commons.

The Government aniline dye scheme was the subject of an extensive debate in the Commons yesterday week upon a supply vote for defraying the charges of the Civil Service and Revenue Departments. Some of the honourable members no doubt heard for the first time how much there is indebtedness to one of the secondary products of the gas industry—tar—for many of the present and permanent requirements of the country, as being the basis for aniline dyes, numerous drugs, that pressing necessity of the war, trinitrotoluol, and much else. They heard, too, from Mr. Runciman of how gas undertakings in the large centres had already rendered direct and great assistance in providing the necessary ingredients for explosives, intermediate products for dye-making, and other bases for the nation's needs. On the main subject—the Government dye scheme—a feature of the discussion was that the strongest critics were those who protected themselves by acknowledging they knew very little about the dye industry and its necessities; and they assailed the scheme with a mass of theory and economic dogma that does not fit an emergency of this kind and a serious attempt to rescue the country from its dependence upon Germany for (at any rate part of) $1\frac{3}{4}$ million sterling of dye stuffs out of the $2\frac{1}{2}$ millions' worth used in a year. Though there was criticism and in abundance, there was not a single constructive suggestion, except a partial one by Mr. Theodore Taylor and Mr. Austen Chamberlain, which again showed the little appreciation there is of the size and intricacies of the problem that is before the country in this particular. The suggestion was that the intermediate bases for the aniline dyes should be sent to Switzerland; the dye produced therefrom being returned here to meet the immediate necessities of the country. But the capacity of the Swiss factories would only be able to afford partial relief; and there would anyway have to be in this country an organized company to deal with the raw material and the finished products under a scheme of the kind. There is no reason why the Company proposed by the Government should not seek assistance from Switzerland to help to meet the pressing needs for certain dyes. Stocks of some of these are getting low, and others are not expected to last another three months. Yet industries with a turnover of some 200 millions and employing $1\frac{1}{2}$ million people are dependent upon these colours and dyes. The position is serious. But only the one suggestion as to Switzerland supplementing home production pending developments here could be advanced, which shows the need for pushing forward with a scheme to make this country independent of outside help.

Protection and Men.

The vote was passed. There was no intention that the criticism should interfere with the progress of the scheme if, as it is or by modification, it can be developed, which it will be if the capital from the users of the dyes is forthcoming, in addition to that to be subscribed by the Government. The principal criticism was directed to what was going to happen after the war; and there was a very general view that, unless there was protection by a suitable import duty for, at any rate, a period—say, for five years following the war—the necessary financial support to a sufficient scheme would not be forthcoming. But Mr. Runciman was able to state that "large numbers" of the users have already tied themselves to the Company for a period of five years after the war is over; and we think the Government may be relied upon (they having a large financial interest in the scheme) to do what is necessary, as events command, to protect the interests of the Company, and the development of the vast potentialities of the country in this direction. Talking of the country's potentialities, we have the raw material, the demand for the finished products, and the right men. On the point of the men, Sir Philip Magnus, referring in the course of the debate to the loose assertions of those who think this country is behind Germany in the supply of qualification, said: "I would like to tell them that we in this country are no less capable than are the Germans to provide an adequate number of scientific chemists." Sir Alfred Mond also said: "The supply is excellent."

Research and Duty-Free Alcohol.

There was criticism as to the inadequacy of the £100,000 the Government are proposing to devote to research in the next ten years; but, on the other hand, their action in regard to alcohol was applauded, seeing that this will remove a serious difficulty. It was announced by Mr. Runciman that the regulations of the Board of Customs and Excise would enable the Company to obtain permission to use alcohol for industrial purposes free of duty, by arranging that the denaturizing of the alcohol is carried out under conditions that will not hamper the industry. It is not expected that the new Company would be able to meet immediately, nor for some time to come, demands for the whole range of colours and dyes, in all their hundreds of shades and other differences. But the Company could at once work for relief in the direction of those required in largest quantities. It is hoped the country will not confess by inaction that it is inadequate to the building-up of an independence of Germany in a manufacture of this kind. To say the least, it is not right, if it can be avoided, for industries in this country, with an annual turnover of 200 millions, to have to rely upon Germany for supplies that are vital to their very existence.

Trade Exhibitions.

With so many complicated matters to deal with, it would be too much to expect that the Board of Trade would meet with unanimous approval in the steps they are taking, through the Commercial Intelligence Department, for the furtherance of British trade; but at least there will be general agreement that they are not allowing the grass to grow under their feet. The opportunity afforded of "doing something" is unique; and to those manufacturers who felt themselves unable to determine just what it was that should be done, the Board have striven to give some sort of a lead. This activity has manifested itself in various ways; the latest being the arrangement of two more exhibitions, intended to be of a helpful nature to British trade. The first of these, which will be held at No. 32, Cheapside, E.C., during the next few weeks, should appeal to manufacturers and exporters; for the object is to enable them to establish themselves in the markets of the different parts of the Empire previously supplied with German and Austrian goods. Shortly after the outbreak of war, requests were made to the authorities in the different places to collect and forward samples of these German and Austrian goods, with the result that it is now possible to show several thousand things of great variety, which have been received from the "four corners of the earth." An inspection should prove instructive to some of our manufacturers—and also, it may be hoped, of assistance. The second exhibition is the exact opposite in character, inasmuch as it is to be a British industries fair—to be held in May, at the Royal Agricultural Hall. This is intended to reproduce the main features of the well-known Leipzig Fair. Here only British manufacturing firms will be allowed to exhibit; and no exhibitor will be permitted to show articles other than those of his own manufacture, and which are included in certain specified trades. Admission to the fair will be restricted to *bonâ fide* buyers for home and over-sea markets, and will be by invitation of the Board of Trade. Thus the first display is for the purpose of showing manufacturers the kind of goods which have hitherto been purchased from enemy countries; the second is intended to be the means of impressing upon buyers the extent to which it is already possible for them to satisfy their requirements (previously met in Germany or Austria) by the aid of British manufacturers. It may be pointed out that the trades which will be represented are those only in connection with which samples of German and Austrian goods have been exhibited by the Board of Trade during the last few months. The results accruing from these displays will quite possibly prove not to be all that is hoped; but the experiment represents an exceptional endeavour to meet an exceptional situation.

PERSONAL.

The Directors of the Woking Water and Gas Company, in their report, refer with very great regret to the death, which occurred some time ago, of their Chairman, Mr. ALFRED H. BAYNES, who joined the Board in 1891, and succeeded the late Sir J. BAKER in the chairmanship in 1909. Mr. J. E. PLUMMER succeeds to the chair, and Mr. A. F. PHILLIPS has been appointed Vice-Chairman; while the vacancy created on the Board has been filled by the election of Mr. E. L. BURTON, who has been an Auditor of the Company since 1895.

Mr. THOMAS P. COLLINGE, Borough Engineer and Surveyor of Mansfield, has been appointed Borough Engineer, Surveyor, and Water-Works Engineer and Manager to the Corporation of Rotherham, in succession to Mr. E. B. Martin, who has gone to Salford. Mr. Collinge is an associate member of the Institution of Civil Engineers and a member of the Institution of Municipal and County Engineers. He has been directly connected with civil and municipal work for upwards of twenty years, having held positions at Carlisle, Nelson, and other places.

In a report which they submitted at last week's meeting of the Town Council, the Smethwick Gas Committee expressed their regret that, owing to the state of his health, Alderman C. W. PINKNEY had been compelled to resign his position as Chairman of the Gas Committee, and placed on record their high appreciation of the valuable services he had rendered to the undertaking during the past fourteen years. Alderman W. H. Goodyear had been appointed in his place. The Mayor and several members of the Council paid high tribute to the excellent work Alderman Pinkney had done; and there was a general expression of regret at the cause which had necessitated his retirement.

Mr. GEORGE CLARRY, of Cardiff, was honoured on Monday of last week by being elected President of the Cardiff Chamber of Trade. Mr. Clarry, who will hold office for a year, is identifying himself with many progressive movements in Cardiff. As a member of the Education Committee, he sits on the body dealing with technical instruction; and he is taking a leading part in the action of the Technical Committee, who are calling a "British Trade" Conference in April. The object of the conference is to show that South Wales can successfully carry on certain trades that have hitherto been confined to Germany; and among the important subjects to be considered is that of the bye-products of coal. In such a matter, of course, Mr. Clarry's experience is of great advantage.

OBITUARY.

We regret to record the death of Mr. WILLIAM DAVIS, who from 1885 till the time of the purchase of their works by the Bournemouth Gas and Water Company, some twelve years ago, was Manager and Secretary of the Town and County of Poole Gas Company. Deceased first entered the service of the Halifax Corporation, under Mr. George Wilson Stevenson, as Assistant-Superintendent of the water-works, about 1854. Some four years later he went to Oldham as Outdoor Superintendent of the gas and water works of the Corporation, with whom he remained until June, 1867. He was then appointed Engineer and Manager of the Canterbury Gas and Water Company, and discharged the duties there till June, 1869, when, having been offered the position of Engineer and Manager of the Hereford Gas Company, he accepted it, and remained with them until the purchase of their works by the Hereford Corporation, whose service he entered, but retired in 1884. While he was with the Corporation he constructed the new works at Widemarsh. In 1885, at the request of the Chairman and Directors of the Gas Company, he took up the position at Poole, and finally retired on the absorption of the Company. He was one of the oldest members of the Institution of Gas Engineers—having joined the British Association of Gas Managers in 1868; and he remained a member until his death. He was also for some years a member of the Midland and Southern Associations. He was a very ardent Freemason, a P.P.Z. and P.P.G. Supt. Wks., Hereford, and the oldest member of the Palladian Lodge, No. 120 Hereford, and the Amity Lodge, Poole. He went through the Chair in the former Lodge, and was for some years its Secretary. His illness was of short duration, and he passed peacefully away in his eighty-fifth year, at his residence, Brampton Villa, Saldown, Poole, on the 16th ult., and was interred in the family grave in Hereford Cemetery on Monday last week.

PRESENTATION TO MR. WILLIAM CRANFIELD.

As mentioned in the report of the proceedings at the meeting of the Yorkshire Junior Gas Association last Saturday which appears elsewhere, the occasion was chosen for the presentation of a testimonial to Mr. William Cranfield, in recognition of the valuable services rendered by him to the Association since its formation.

The PRESIDENT (Mr. J. W. Lee), in introducing the subject, said the afternoon was like old times, when they found Mr. Cranfield among them once more. The Yorkshire Junior Association had never seemed quite complete in his absence during the past few months. Mr. Cranfield had been in at the inauguration of the Association, and had been one of its most able supports ever since, up to within about a year ago, when he left the county. The work he had performed, both before and behind the scenes, had been very great indeed. They could not attempt to recompense him for all that he had done. They did, however, wish to offer him some tangible token of their gratitude and thanks; and they were privileged that day to give him something of his own—or rather of his wife's [laughter] choosing, as a definite record of their "Thank you's" as an Association. He thought he might add to the interest of the occasion by asking Professor Cobb, as a representative of the gas industry in the Leeds University, to make the presentation on behalf of the members.

Professor COBB said he had been given an entirely unexpected pleasure and honour, though he was sure the members might have chosen somebody who had had a much longer association with Mr. Cranfield than he had had. His own personal regard for Mr. Cranfield, however, was as deep as that of any member; and he had the greatest pleasure in making the presentation.

Professor Cobb then presented to Mr. Cranfield a handsome silver tea service.

Mr. CRANFIELD, who spoke with evident emotion, said the day was one of the proudest of his life. It was a great privilege and pleasure to have been able to do anything for the Association in the past, and anything to help the young men of the industry. No work throughout his life had given him more unalloyed gratification than had what he had been able to do in connection with the Association. He was sorry his wife could not be with him that day; but the distance was too great. The Association occupied too dear a place in his regard for him to need any such tangible proof of their interest as they had given; but the gift would be to him an additional reminder, and always a thing of the greatest delight. It was an added honour to receive the gift at the hands of Professor Cobb. He (Mr. Cranfield) had never been privileged to have the full course at Leeds University; but he owed a great deal to the institution, from which he had learned much. He had not seen a great deal of the members of the Association during the past twelve months; but he would never forget them, or get out of touch with them so long as he lived. [Applause.]

Mr. CHARLES ROPER said he could not rest without adding a word of testimony to the regard felt for Mr. Cranfield.

The HON. SECRETARY (Mr. E. Garsed) said he wished to add his word also, and to make the announcement that Mr. Cranfield's name now disappeared from the list of ordinary members, and appeared instead as an honorary member of the Association.

Power Trucks for Closing Water-Mains.

The "Gas Review" (Wisconsin) for January contained an article dealing with bursting water-mains and the method of controlling them in America. The following is an extract from it: "Bursting water-mains are not so great a menace to life and property in the city of Boston since the Water Department installed a White truck with a power appliance for quickly closing the heavy gates. This mechanical device, an invention of Mr. George H. Finneran, the Superintendent of the Distribution Branch of the Water Department, not only conserves the water supply and reduces the damage due to breaks, but permits of rapid regulation of water volume at fires, removes the limitations of physical endurance, facilitates the testing of gates, and relieves the anxiety always attending derangement or damage to the water system. In one of Boston's most important thoroughfares, lined with costly buildings, there is a water-main which, if completely broken apart, would allow the escape of 50,000 gallons of water per minute. Controlling this line are gate-valves, 36 inches diameter, which, in closing, require 307 turns of a gate wrench and the services of four men for about 45 minutes. A few minutes' delay sometimes means the loss of life and thousands of dollars. These gates, the largest in the city, can now be closed in ten minutes by one man and the White truck."

Coal-Tar Products in America.—Mr. Thomas H. Norton, late American Consul at Chemnitz, Germany, has been appointed a commercial agent of the United States Department of Commerce, to undertake a special investigation of the chemical industry in the States, particularly with respect to coal-tar products.

Calcium Cyanamide Production.—The "Chemical News" is reproducing Dr. L. H. Baekeland's Chandler Lecture, delivered at Columbia last year, on "Some Aspects of Industrial Chemistry;" and in the portion contained in the current number, reference is made to the use of synthetic nitrates as fertilizers. The author says: "Though the synthetic nitrates have found a field of their own, their utilization for fertilizers is smaller than that of cyanamide; and the latter industry represents to-day an investment of about $30,000,000, with three factories in Germany, two in Norway, two in Sweden, one in France, one in Switzerland, two in Italy, one in Austria, one in Japan, one in Canada, but not any in the United States. The total output of cyanamide is valued at $15,000,000 yearly, and employs 200,000 H.P., and preparations are made at almost every existing plant for further extensions. An English company contemplates the application of 1,000,000 H.P. to the production of cyanamide and its derivatives, 600,000 H.P. of which have been secured in Norway and some 400,000 H.P. in Iceland."

THE GAS INDUSTRY AND THE WAR.

The Treasury announce that, in view of the complexity and volume of work involved in dealing with applications for export and import licences during the war, a special department under the Treasury (to be called the War Trade Department) has been formed, to replace the Committee on Trade with the Enemy so far as this work is concerned. The Right Honourable Lord Emmott, G.C.M.G., has consented to act as Director of this Department; and Sir Nathaniel Highmore, K.C.B., will be the Secretary. The War Trade Department will deal with all applications for the grant of export and import licences, and will embrace an Intelligence Division, which will serve as a clearing house for all war commercial information. The remainder of the work of the Trading with the Enemy Committee (relating to the movements of funds and other questions in which the Treasury is mainly concerned) will be transferred to the Treasury, and will be performed by Sir Arthur Thring, K.C.B., the Parliamentary Counsel, and his staff.

The statement appeared in "The Times" last Tuesday that a Committee has been formed in the City, under the name of the Cornhill Committee, to make confidential investigations into the course and extent of German trading and financial operations. At the request of the Governor of the Bank of England, Mr. Austen Chamberlain accepted the chairmanship of the Committee, which has already received much valuable information from the City. All communications intended for the Committee should be sent either to him, or to the Secretary, Mr. Wynnard Hooper, at 2, White Lion Court, Cornhill, and be marked "Private."

It has been officially announced that the Home Secretary has appointed a Committee to inquire into the conditions prevailing in the coal-mining industry, with a view to securing such organization of work and such co-operation between employers and workmen as will set free for enlistment the largest possible number of men qualified for military service, without interfering with the necessary production of coal during the war. The members of the Committee are: Sir R. A. S. Redmayne, the Chief Inspector of Mines (Chairman), the Earl of Crawford and Balcarres, Mr. Vernon Hartshorn, Mr. A. F. Pease, Mr. C. E. Rhodes, Mr. Robert Smillie, and Mr. Stephen Walsh, M.P. The Secretary to the Committee is Mr. W. E. T. Hartley, one of the Junior Inspectors of Mines for the Scotland Division.

There are daily sittings of the Committee appointed by the Board of Trade to inquire into the causes of the rise in the retail price of coal sold for domestic use, especially to the poorer classes of consumers in London and other centres. The following are the members of the Committee: Mr. Vaughan Nash, C.B. (chairman); Professor W. J. Ashley, Birmingham University; Mr. W. Crooks, Labour Member for Woolwich; Mr. J. J. Dent; Mr. A. W. Flux (Director of the Census of Production, Board of Trade); and Mr. Stanley Machin.

Towards the close of the half-yearly meeting of the South Suburban Gas Company, a proposal was made that some means should be taken to convey to the Company's men at the front (numbering 160) the appreciation of the proprietors of their services to the country, together with their good wishes. This was at once acquiesced in. At a later stage, a proprietor suggested that some little gift, in the way of a personal comfort, should accompany the resolution, so as to give added expression to the proprietors' appreciation. The Chairman (Mr. Charles Hunt) said the suggestion would be taken into consideration by the Board, who would be very pleased to give effect to it, if found practicable. They lost no time in doing this, as a letter, in the terms of the resolution, was sent last Wednesday to each of the Company's employees serving with His Majesty's Forces, accompanied by a small parcel, containing tobacco, cigarettes, a pipe, and chocolate, as a tangible mark of the proprietors' appreciation of his services, with their earnest wishes for his welfare, success, and safe return.

The "Board of Trade Journal" states that, according to "Stahl und Eisen," the output of the German Coal Syndicate in 1914 was the lowest since 1910, and only amounted to 84,810,000 metric tons, as compared with the record figure of 101,652,000 metric tons in 1913. During 1914, the output of coke amounted to only 14,816,000 metric tons, as compared with 21,252,000 metric tons in 1913; while the output of briquettes decreased from 4,574,000 metric tons in 1913 to 3,918,000 metric tons in 1914. The metric ton equals 2204·6 lbs.

An application was made recently to the Magistrates by Mr. A. E. Young, on behalf of the Hastings and St. Leonards Gas Company, in respect to their insurance fund. The Company, he explained, had power, after paying the authorized dividends, to provide themselves with an insurance fund to meet any exceptional circumstances which, in the opinion of a Court of Summary Jurisdiction, due care and management could not have prevented. He applied to the Bench for permission to take £121 15s. 6d. from the insurance fund to meet the high rates of freightage, asking the Bench to say that the war was an exceptional circumstance. During the past six months, the Company had had to pay for special war risks and freightage. The application was granted.

As showing the great extent of the German "copper famine," it may be mentioned that the Madrid correspondent of the "Daily Telegraph," under date Feb. 19, reported: "Several gas-engines have been delivered here by German manufacturers. The machines have arrived complete in all details, except the bearings. The latter were not included, as the Government had evidently prohibited the export of any article containing copper or its alloys. To supply the deficiency in these machines, the makers have sent wooden patterns of the bearings, requesting buyers to arrange to have them cast in Spain, owing to their inability to supply them."

The following graphic reference to the North Sea Fight is taken from a letter received by Mr. John Squires from his son, Peter Squires, serving on board H.M.S. "Laertes." Mr. Peter Squires is an employee of the Davis Gas-Stove Company, Limited; and his brother, Mr. A. G. Squires, is the firm's Scotch representative:

> I am glad to say I came through the North Sea battle without a scratch, although my boat was in the thick of it from start to finish. It was terrific. We blew the German ships almost out of the water, sinking two; and the others which participated in the fight will be absolutely no good for further service for at least six months. Sea fighting is a terror. What impressed me most was the exultation which we derived when our broadsides struck the enemy's ships; and then the feeling of pity which one felt, seeing the fine ships turn over and sink. Then the feeling of exultation comes on again; and almost in one supreme breath, we give three rousing cheers.
>
> We had the enemy's ships on fire after three hours' fighting. Another curious thing I noticed was that after the fight the sea was literally covered with dead fish. The "Blücher" was the last ship to sink; and my boat, accompanied by five others, ran to pick up survivors—there being about 200 in the water. One of the enemy's aeroplanes came over us, dropping bombs, which soon put us to flight, leaving the men drowning all around us. It was a most dastardly act. The cries of the wounded, some armless, more past recognition, were simply past description, and never to be forgotten; and just to think their only means of rescue had been cut off by their own countrymen! But such is war; and we can wage it with a vengeance when necessary.
>
> I picked up the commander of the "Blücher," going over the side with a life-buoy, and helping to lift him over the side.

Readers will be interested to learn that Mr. W. J. Devers, who represents Messrs. G. Hands and Co. in Wales and the Midlands, is the proud father of four sons now serving their King and country. Mr. Devers is well known on the road as a genial companion; and he has won some popularity in another direction. He is the author and composer of one of the most successful sea songs of the nineteenth century—"Our Jack's come home to-day," which is still a great favourite wherever it is heard. Several other songs and ballads are to Mr. Devers's credit.

Presiding at the annual meeting of the Hartlepool Gas and Water Company last Thursday, Mr. O. K. Trechmann referred, as was to have been expected, to the recent bombardment, and remarked that there was no doubt that a dead-set was made on the gas and water supplies. He quite thought the Germans were well acquainted with the position of the gas-works, as they made holes in all three of the holders, not only releasing the gas they contained, but damaging them beyond all expectations. He said great credit was due to all concerned for the smart manner in which No. 2 holder was repaired. On the following Friday evening they were able again to supply the town with gas, though there had been about 300 holes to patch, as well as some new plates to insert. They were undoubtedly fortunate in not having any vital damage done to the water-towers, though the shells were flying all round them. The guns at the Hartlepool batteries did good work, and it was believed that one, at least, of the enemy ships—the *Von der Tann*—came in for a very unpleasant experience. She had not been heard of since.

Mr. J. E. Troughton, second son of Mr. J. H. Troughton, the Engineer and Manager of the Newmarket Gas Company, has been gazetted as Second Lieutenant in the 11th Battalion West Riding (Duke of Wellington's) Regiment. He enlisted at the outbreak of the war, and held the rank of Corporal in the 4th Battalion of the West Riding Regiment. Before joining his new battalion, he has gone to Tunbridge Wells for a period of training with the South Lancashires.

Mr. Martin Fitzgerald, son of Mr. M. Fitzgerald, the Secretary of the Limerick Gas Committee, has been given a commission in the Royal Welsh Fusiliers.

Mr. J. E. Pearce, the Distribution Superintendent of the Romford Gas Company, who joined the Colours soon after the outbreak of war, has received a commission as first lieutenant in the Royal Engineers. He was at first attached to the Inns of Court Officers' Training Corps. Private F. Stewart, an employee of the Company, who re-joined his regiment on mobilization, has

died of wounds. In all sixteen of those employed by the Company have joined the forces. The Directors have undertaken to keep their places open for them, and are making up the difference between their Army pay and what they would have received at home.

It has been decided by the Huddersfield Gas Committee that the price of coke at the gas-works be reduced from 10s. to 6s. 8d. per ton during the war; and that until the present stock of breeze is exhausted, the price be lowered from 3s. 4d. to 2s. 6d. per ton.

ELECTRICITY SUPPLY MEMORANDA.

THE reports of directors, and the record of speeches made at annual meetings of Metropolitan Electric Supply Companies, show that, for the same reasons that have affected gas supply—lighting restrictions, and curtailed power requirements where industry is not working up to normal mark—the past year's trading has not been so healthy as during the year preceding. This is only the realization of the expected. The result has been that, in some instances, dividends for the past year have had to be reduced, which has likewise been the case to a small extent where gas companies have had to advance the charges for their prime commodity. There is, for example, the St. James's and Pall Mall Electric Supply Company paying 10 per cent. on the ordinary shares, against 12 per cent. the previous year. There is also the Westminster Electric Supply Corporation, paying 9 per cent. as compared with 10 per cent. the previous year. In most cases, the London companies supplying electricity only issue annual accounts, and meet annually; and, this being so, the effect on the trading under war conditions is partly obliterated by the seven months' working under normal conditions. However, the Directors are able to approximately judge from the past few months' working what is likely to happen if the war lasts throughout the current year, although with the compulsory lighting restrictions, and the growth everywhere of firmer resolutions on the part of individuals to economize in order to meet the additional demands upon their purses for national and private requirements, it does not do to place too much reliance upon the continuance of results on the lines of the past three or four months, subject, of course, to the variation occasioned by the seasons. In some shopping areas, there will be a very bad time during the summer months—if the war does not collapse. Mr. Walter Leaf, the Chairman of the St. James's and Pall Mall Company (who supply the *élite* among the shops of the West-End), states that the effect of the war on their commercial position was instantaneous. In view of this, the Company's output last year dwindled from 11,605,000 units to 11,171,000 units—a loss of close upon half-a-million. The decrease is equal to 3·7 per cent., and the revenue receded by 4·1 per cent. In the case of the Westminster Electric Supply Corporation, the gross receipts last year fell by £5700, while expenses were reduced by only £1800. The Notting Hill Electric Supply Corporation, which (like the National Electric Supply Corporation) is a co-partnership concern, had a drop in the revenue, taking the whole year, of £759, though the estimate is that the loss through the lighting restrictions is about £2000. The Smithfield Markets Company found their net profits slip back from £4237 to £3139; and the Company are only paying 2 per cent. on the ordinary shares. By the way, the management of this Company is having life made more miserable than it need otherwise have been by the Diesel plant installed two years ago, which has not been paid for, nor is the bill going to be settled until a dispute with the contractors is definitely composed. The engines are accused of being of bad design, of giving a great deal of trouble, and of being a constant source of expense—to say nothing of the increase in the cost of oil. These are a few items by way of illustration of how things have gone with electricity supply companies.

War Effects.

The London Companies' Scheme.

When originally noticing the Bill promoted by ten London Electricity Companies, which adumbrated an extensive scheme of amalgamation and subsequent enlargement by fusion until the separate undertakings were exhausted, we remarked that it seemed to us the proposed Company would serve admirably as the operating Company proposed by the County Council in their scheme, though the Company project was not devoid of objectionable feature. It now transpires, from a statement by Mr. Walter Leaf, at the meeting of the St. James's and Pall Mall Company, that the promoting Companies have throughout been in negotiation with the County Council, endeavouring, if possible, to work in harmony with them. Mr. Leaf said "the result of these conferences" was the deposit of the Bill which provided among other things for "the establishment of such an operating Company as the Council contemplate." But with the inability of the promoters of the Council Bill to obtain the necessary majority in the Council to the ratification of the prosecution of the Bill this session, and in view of the statement of the Prime Minister that no contentious business would be taken owing to the war, it was highly probable, in Mr. Leaf's opinion, as in that of other people, that the Companies' Bill would also be hung up. As a matter of fact, Mr. Whitley (the Chairman of Committees of the House of Commons) stated yesterday week, in regard to the Council measure, that he had informed the promoters that, in his opinion, the Bill was not one which the House ought to be called upon to consider in the present session—raising, as it did, important and contentious questions. Consequently, the Bill was withdrawn. What applies in this respect to the Council Bill applies equally to the Companies' measure. However, the Companies who are concerned in the promotion are fully determined (if there is at any time consummation of the scheme) upon certain things in parting with their properties to the central Company or to the London County Council. One is that the price and conditions must be fair, with full consideration for the position in which each Company has been placed by prudent administration. An important principle on which all the Companies who are parties to the agreement are in accord is that all centralization of the supply must proceed by development of existing resources, and not by scrapping precipitately what has already been effected. It is clear that one difference of opinion existing between the Companies and the Council and Mr. Merz has reference to concentration of plant in one or two large stations. The Companies are convinced that the safety of electricity supply is not in the direction of concentration. There is another point that appears plain; and it is that the Companies have felt themselves forced into their scheme by the powers already possessed by the County Council (which will have their consummation within measurable time), and by the ardent manner in which the Council have been, until checked, pursuing their ideal of concentration and unification. When Mr. Leaf will not admit that London has any reason, even under existing conditions, to be ashamed of the cost of its electricity supply, and is able to assert that the cost of the supply is at least as little as that of any other great city in the world, then the ground is cut from under the very foundations of the case for concentration. The same point receives incidental reference in the report of the Directors of the London Electric Supply Corporation. The Corporation sold last year 46,343,000 units, against 35,336,223 units. The power supply for traction and tramway purposes increased by 43 per cent., and for industrial purposes by 23 per cent. The average revenue per unit sold last year was 0·94d., as against 1·04d. the previous year. The Directors of the Company draw special attention to these figures, in view of the repeated statements by interested people that London is suffering from want of a supply of cheap electricity. Such figures as these, and the dividends paid by the Companies, will no doubt form a good feature in the case of the Gas Companies (when the schemes are taken into consideration by Parliament) against any provision being made, under any consolidation scheme, for the deficits of revenue being made a charge upon the rates.

Price Advances.

Generally speaking, electricity suppliers are doing their utmost to refrain from the raising of the price of their commodity. This is a very proper thing for them to do, in view of the competition of economical agents, although they are hard-hit by the trouble that exists over the fuel question. But in some instances, as previously announced in the "Memoranda," there have been increases. We doubt, however, whether publicity has been given to all the advances that have been made. There is a chance that the list of price-raisers will include Dublin, while at Wednesbury notice has been given of a 15 per cent. increase on the net amount of accounts, as the Mond Gas Company, who supply gas for generating purposes, have notified their intention to raise the schedule price for their gas. The Committee state that the ability of the Mond Gas Company "to continue the supply to the Corporation depends on the length of the war, and the conditions of industry. But the Committee hope it will be unnecessary to announce any further increase in the price of electricity, and that it may be possible within a short time to reduce the temporary increase of 15 per cent. now rendered necessary." The increase will seriously affect big manufacturers in the district, several of whom take a large supply of current, both for lighting and power purposes. This method of increasing the price, by means of adding a percentage to the accounts, directs attention to the difficulty there would be in making an all-round advance in electricity charges in a borough (say) like Marylebone, where there are more or less a dozen different forms of tariff in use. In the case of a district where both a flat-rate is in operation and charges based on the rateable value, *plus* ½d. or 1d. per unit, how are the suppliers to equitably apply any increase? However an increase was applied in such a case, it would be arguable whether equity was consistently observed.

Silly Theory.

Will someone kindly convey to Mr. R. Weaving, who recently read a paper before the Birmingham Electric Club, the information that he is ridiculously wrong in his theoretical calculations concerning the efficiency of the modern gas-fire. He takes gas at 2s. 3d. per 1000 cubic feet, which will give 37 cubic feet for 1d. He credits the 37 cubic feet with generating 22,200 B.Th.U., which in the gas-fire are disposed of as follows: "1 cubic foot of gas takes 1½ lbs. of air for combustion, so that 55½ lbs. of air are heated to about 550° Fahr. in the process of combustion. This is equal to 5060 heat units lost in the flue. Allowing 11,000 heat units for poor combustion and air carried up the flue in addition

to that required to support combustion, there remain only 6140 heat units for useful work." It is extremely kind of Mr. Weaving to allow even as much as this, seeing that he hails from Ferranti's. He subsequently arrives at this comparison of useful heat units realized for 1d.:

	Heat Units.
Gas, at 2s. 3d. per 1000 cubic feet	6,140
Electricity, at ½d. per unit.	6,820
Coal, at 20s.	14,000

Instead of this theoretical absurdity, if Mr. Weaving will study authentic tests made with all the scientific equipment available for heat measurement—such as those carried out at the Leeds University, by Professor W. A. Bone, Mr. W. J. Atkinson Butterfield, M.A., F.I.C., and others, he will find that of the total heat units generated in the modern gas-fire by the combustion of the gas, approximately 50 per cent. is realized in the shape of radiant heat, 25 per cent. as convected heat, and only about 20 per cent. is carried up the chimney—doing useful work at the same time in renewing the air of the room, and keeping it in motion, thus avoiding the stagnation of atmosphere which the scientist of the day who has studied the matter tells us is very detrimental to human health and comfort. We hope Mr. Weaving will go deeper into the matter, so as not to make himself look foolish in future in the eyes of scientific men who know more about the subject than he does.

Domestic "Half Watts."

The "half-watt" lamp in domestic sizes is not yet with us, though there has been talk of argon-filled lamps; but "Installation Topics" in the "Electrical Times" recently pointed out that, by means of transformers, and reduction to very low pressures, it is possible to use the small unit-lamps made for motor cars, &c. Before the war stopped supplies from the Continent, our contemporary states, it was possible to obtain lamps giving 50 and 100 candle power for a consumption of 24 and 48 watts respectively. For lower pressures still—from 6 to 12 volts—units of 24 to 100 candle power are listed. The latter types are now made in this country; and the makers inform the writer that there is no difficulty in manufacturing half-watts for 25-volt supplies, giving 50 hefner units for 24 watts, or 100 for 48 watts. Either size is small enough for domestic service. If the makers were in a position to supply half-watt lamps for 25 volts, householders in alternating current areas could, it is submitted, avail themselves at once of their high efficiency, and either reduce their lighting accounts proportionately or double their illumination for the same cost. The automobile type, for voltages up to 12, are available; and there seems, it is remarked, no reason why householders with alternating current supplies should not transform locally to 12 volts. This pressure would be too low for the entire installation in most cases; for the voltage drop would be excessive with the small wires usually employed for domestic lighting. But a local transformer might be placed across the circuit for rooms in which the lights are used the most. The initial cost of the transformer, it is suggested would probably be repaid in the first lighting season. Nothing is said here about losses due to transformers. When transformers were previously introduced, consumers did not like them. They have their disadvantages, too, in the development of the domestic uses of electrical energy. We are doubtful about consumers adopting the proposal made in the foregoing.

Troubles with "Half-Watt" Lamp Fittings.

Writing in the "Electrical Review," "Research" criticizes the fittings supplied for use with "half-watt" lamps, commenting on the trouble occasioned by them. The large unit lamps take a considerable amount of current, which necessitates care in connection with the lamp-holders. The Edison screw-cap is the one adopted; but if the lamp is not screwed-up tight, there is heating, and ultimately arcing, at the top connection. In some types of fittings, the long stem of the lamp has to be pushed up through the reflector; and the lamp has to be screwed-up by taking hold of the bulb. Result, several lamps are broken when the person engaged on the job puts forth too much strength. Lamps near tramways, unkindly, through vibration, become slightly unscrewed, producing arcing at the top contact, and welding of the lamp to the holder. For interior illumination, indirect lighting is preferred, in order to shield the eyes from damaging glare. This has the advantage over any enclosed system that the lamp is freely exposed to the air. "The heat given off by these lamps is surprising." Consequently, for outside illumination, "the lamp must be completely protected from rain, as a drop of water on the globe, which is at a high temperature, cracks the glass at once." "Research" advises the manufacturers to aim especially at two things: Protection from weather, and a "very free" circulation of air past the lamp, to keep down the temperature. Because it is difficult of accomplishment, some makers treat the second requirement as of little importance. This is a mistake, for these reasons (apart from lamp destruction): Copper is discoloured by the heat; white enamel or paint used for reflecting purposes is turned brownish; sweating takes place at the upper part of the fitting; and then the fate of the lamp is sealed, through the moisture dropping and cracking the globe, unless some means are provided for its removal. The initial cost of the lamps being quite high, their safe housing is of paramount importance.

ELECTROLYSIS AND GAS-MAINS.

For gas and water engineers, the proceedings at last Tuesday's ordinary meeting of the Institution of Civil Engineers were of more than usual interest, as the subject-matter of the paper read was "The Electrolytic Action of Return Currents in Electric Tramways on Gas and Water Mains; and the Best Means of Providing against Electrical Disturbances." The author was Mr. H. E. Yerbury, M.Inst.C.E. The subject is not now, of course, of quite such active importance as it was in the earlier days of electric traction, which, after all, are not so very long ago. The columns of the "Journal" have, however, from time to time reflected the feelings of apprehension in regard to the real or supposed danger of damage to gas-mains from vagabond electric currents; and other literature on the subject is to be found in various papers, but chiefly in the "Journal of the Institution of Electrical Engineers," under such titles as "Earth Returns for Electric Tramways;" "Earth Currents Derived from Distributing Systems;" "Electrolytic Corrosion;" and "Electric Traction Vagabond Currents."

It appears now to be well established that the old theory of rusting being caused by the direct action of acids has to be discarded, like so many other notions previously, and even recently, held. The chemistry of rusting and corrosion, which the author first proceeded to deal with, has shown that pure iron will dissolve in pure water, and that iron will not rust through moist air, in which are carbon dioxide and oxygen, unless and until the temperature is so reduced that water forms on the iron, thus causing an electrolyte. The foundation of the theory upon which the paper wss written is that all corrosion is essentially electrolytic. "Solution-pressure," which may be either positive or negative, is a term for measuring the tendency for all molecules to pass to the ionic state. Ferrous ions are sent into the solution, in the case of the solution-pressure of iron, the solution being charged positively, while rendering the iron surface negative. In distilled water, the action of the ferrous ions produces an excess of positive ions, and some of the hydrogen ions give up their charge to the metal and become atomic hydrogen. In ordinary water, acids intensify the concentration of hydrogen ions, and the action is accelerated. The rate of corrosion is increased where carbonic acid, formed from carbon dioxide and water, is dissociated into hydrogen ions, as thereby an electrolyte is provided, producing a current by means of the anodic and cathodic particles in iron or steel. Corrosion is assisted by the non-homogeneity of a metal, as there are then a greater number of small anodes and cathodes, with correspondingly greater action than in one large electrode. The effect of oxygen is to oxidize the layer of hydrogen and to precipitate the iron.

The fear of danger to gas and water pipes through electrolysis caused by leaking current, especially on the first introduction of electric traction, was no doubt largely due to the early troubles experienced in the United States. But the Board of Trade rules and regulations, modified from time to time, have largely, if not altogether, removed this danger. The Sheffield United Gas Light Company obtained a protective clause in the Sheffield Corporation Act, 1901, to the effect that nothing in the Act should relieve the Corporation from any liability to make compensation in respect of proved damage from electrolytic action to any pipes. No other instance, it is said, is known of such protection having been given by Parliament subsequently to the Sheffield Act, 1901. Confidence has been restored, and the factors causing electrolytic action are more fully understood. The desiderata in tramway construction are to comply with the Board of Trade rules (revised in 1903), to use as little copper, and to waste as little energy, as possible. Factors of damage are the character and conditions of the metals, temperature, nature of the electrolyte, and the density and duration of the current. Though there is always a leakage current, yet when tramway rails are renewed, even after ten years' service, they are found not to be corroded, and to be without black pitting. Such condition is no doubt to be attributed to a film of insoluble oxides on the rail surface.

The author thinks that damage to pipes in Great Britain from electrolytic action from leakage currents has been exaggerated; and he exhibited several examples of pipes, both cast-iron and lead, badly corroded without any help from external electromotive force. The structure of some metals facilitates the effects of electrolytic action. Grey forge pig iron, for instance, which is largely used for gas and water mains, contains a considerable amount of free graphitic carbon and silicon. It is more liable to pitting than white iron, which lasts longer, though it is more brittle and difficult to cut and drill, and unsuitable for general foundry work. The presence of silicon seems likely to increase corrosion, and white iron ordinarily contains less than 1 per cent. of silicon, while grey iron may contain up to 3 per cent. Cast-iron pipes are less susceptible to both inside and outside corrosion than are steel pipes.

The author next proceeded to set out the preventive measures originally adopted to reduce potential differences between tracks and pipes, and described the application of negative boosters, of which there are three on the Sheffield tramway system. Gas-mains, it was admitted, are exposed to greater danger than rails, because the pipes may be in a small area of abnormal soil liable to electrolytic action. Obviously the in-flowing current to pipes

is innocuous; it is the out-flowing current from pipes to earth and rails that may be mischievous.

Provisions against electrical disturbances were then considered, and the early recommendation of bonding gas and water mains to the rails was condemned. If tramway feeders are properly arranged, and pipes carefully laid, there is no need to fear damage from stray currents. The Board of Trade maximum rail-potential of 7 volts is sufficient protection. In Great Britain, pipes have been safeguarded by adopting insulated return cables. Electrolytic surveys and current tests between gas-mains and tramway rails are, in the author's opinion, frequently misleading. The network of gas and water mains and service-pipes in a large town is considerable, and unavoidably some mains near to tracks may act as pilot wires and carry a potential difference from one part of the soil to another. The resistance or conductivity, whichever it may be, will vary according to the surface resistance of the pipes to the surrounding soil. Thus pipes laid within a few inches of one another have been found at Sheffield to have different voltages. Pipes should be laid not less than 2 feet away from the rails; but even if only 1 foot away, the author's view is that, under Board of Trade conditions, they are safe. Pipes often touch the tramway poles; and when the latter are bonded to rails, the former are practically at rail-potential. Earth currents there have always been. When the Sheffield tramways were entirely shut off, tests showed a potential difference between gas and water mains and tram rails varying from 0·11 volt to 0·66 volt. This might have been due to leakage from electric cables, or to various metals in contact with different electrolytes.

In summarizing his conclusions, the author admitted that all action is not necessarily electrolytic, though there seems to be a connection between electrolytic and chemical processes. A speck of rust on iron may start a galvanic couple, and electrolytic action may develop incrustation. Cast-iron is more resistant to corrosion than steel because of its surface skin or chill bringing about a partial change to white iron. If this skin is removed, as by machining, corrosion is facilitated. Thermal or mechanical stresses in manufacture have also to be considered, and the researches of metallurgists might be directed to discover whether or not corrosion in steel pipes is due to local electrolytic couples caused by some crystalline combination.

The discussion upon the paper was opened with some interesting remarks by Mr. H. E. Jones. He congratulated the author upon the dispassionate tone of his communication, and referred to its appeal to those engineers who were neither chemists nor electricians. Notwithstanding electric traction, very little injury had been occasioned. The speaker referred to the rapid damage that had occurred to some pipes in Bombay, which had lasted only a few months, instead of about fifteen years. He thought that electrolysis might be set up chemically, and that the introduction of mild steel had had some effect in this direction; it might be from something inherent in its structure. In this connection, he instanced the plating of gasholders, in which in some cases (as in a gasholder at Calcutta, which showed signs of leakage after six or seven years) there was a positive penetration of the metal, almost as though it had been drilled, and yet no apparent rusting or corrosion. Some plates, on the other hand, would be entirely without such penetration. In the Calcutta gasholder there was no connection with any stray electric currents. The paper had directed his mind to the cause of these minute penetrations. Was it something in the constitution of the steel itself?

Mr. A. P. Trotter spoke of the importance of following the Board of Trade regulations, which were first drafted by the late Sir Courtenay Boyle. In cases where pipes had been produced as having been damaged through electrolytic action, the regulations had not been complied with. Mr. W. J. E. Binnie, speaking as a water engineer, raised the question of the advisability of having pipes 2 feet from rails, even if bedded in concrete. He queried also the author's statement as to the replacing of steel pipes by cast iron. He had noticed pitting on the Coolgardie steel mains in West Australia, but such pitting had not been deeper than $\frac{1}{8}$-inch. Local corrosion showed itself where there had been most strain. Other speakers described their observations of pitting in the case of zinc sheets for roofing, and of oil tank plates, which, in one instance where town water for testing was used, became like the undulations of a sandy seashore.

The author, in his reply, said, in reference to the gasholder plates described by Mr. Jones, that corrosion would not take place without its being started by moisture, which might then give play to the effect of structural composition. All corrosion was due, it was now generally admitted, to electrolytic action, and not to the action of acid as formerly supposed. Pitch or tar was better than concrete for the protection of pipe lines. It gave a higher resistance. In England, there was no serious electrical leakage from tramway systems.

A remarkable record of long service with the Liverpool Gas Company was brought out at the meeting of shareholders last week. The late Secretary, Mr. P. F. Garnett, held office for forty-five years; the late Treasurer, Mr. J. F. Robinson, retired after thirty-seven years' service; the present Engineer, Mr. Edward Allen, M.Inst.C.E., has lately celebrated, and been congratulated upon, his jubilee with the Company; and his predecessor, Mr. William King, M.Inst.C.E., who was present at the meeting, filled the position for forty-eight years, in succession to his father (Mr. Alfred King), who held it for a long period.

A NOVEL MOUSE-TRAP.

Many advantages have been claimed for the modern form of gas-fire pillar radiant; but it may be doubted whether its most enthusiastic supporter would have thought of including among these advantages its possible use as a mouse-trap. Yet the fact that a gas-fire radiant can on occasion catch an unwary mouse is demonstrated by the accompanying photograph, which has been forwarded by Mr. Alexander Masterton, the Engineer and Manager of the Edinburgh and Leith Corporations' Gas Commissioners. It will be seen that the unfortunate little creature, like many wiser ones, succeeded in getting into a position from which he found it quite impossible to extricate himself.

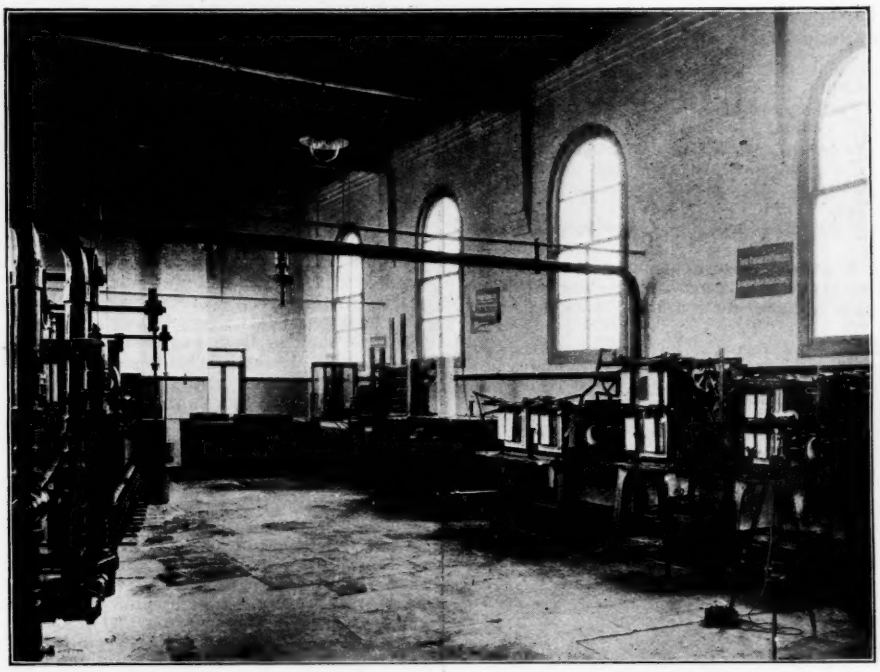
Automatic Lamp Lighting and Extinguishing in Florence.

At the meeting of the Société Technique du Gaz en France at Marseilles in 1911, M. Cabrier, the Manager of the Florence Gas-Works, submitted a paper in which he described his device for lighting and extinguishing lamps at a distance by means of a bye-pass burner; and a translation of his paper was given in the "Journal" for June 6, 1911 (p. 670). The appliance is in use in Florence. The military authorities have lately had their attention directed to it, with the result that Colonel de Angelis, Director of the Military Engineering Department, was commissioned to report upon it. We learn from "Il Nuovo Giornale" that he recently visited the gas-works, accompanied by Sig. Damiani, and was received by M. Cabrier and Sig. Giulio Maggiolo, the inspector. After witnessing the various operations to increase and decrease the pressure in the gasholder, from which the city is supplied, Colonel de Angelis expressed a wish to have all lights extinguished within the zone of automatic control at 9.30 p.m. and ignited again at the expiration of three minutes. Then, in the company of the other gentlemen already named, he went to the Carraia Bridge to witness the result of the trial. At 9.30 p.m. all the lights were extinguished in 25 seconds in an area comprising bridges, squares, streets, &c., and at 9.33 p.m. were re-lighted in 30 seconds. The trial was consequently perfectly successful. Since M. Cabrier introduced his appliance three years ago, he has greatly improved it. At present, we understand, it is only in use in Florence; but it is expected that it will shortly be employed in Italian frontier and coast towns.

Manchester and District Junior Gas Association.—Arrangements have been made for members of the Association to visit the Preston Gas-Works next Saturday; and after the inspection, and tea, Mr. W. Buckley will read a paper on "Deposits in Manufacturing and Distribution Systems." This was the date originally fixed for a visit to Darwen; but the war has delayed the completion there of the Munich carbonizing chambers, and in accordance with the wish of Mr. A. H. Smith, the Engineer and Manager, the visit has been postponed until the new plant is at work.

Effect of Oil on the Calorific Value of Water Gas.—The "Question Box" in the "Bulletin" of the American Commercial Gas Association recently contained the following inquiry: "What is the effect of oil in water gas on the B.Th.U. value?" The person replying was asked to show this as a percentage at all temperatures and pressures met with in practice, and to state how the variation of oil in the gas affected the operation of such gas appliances as lamps, ranges, cauldrons, and so forth. The following reply, furnished by Mr. R. Ffrench Pierce, the Manager of the Illuminating Engineering Laboratories of the Welsbach Company, of Gloucester (N.J.), appeared in the "Bulletin" for last month: "Assuming the gases produced by cracking-up the oil to be thoroughly fixed and the gas properly purified, the effects of varying the amount of oil used in carburetting water gas would be those due to increased calorific value. Generally speaking, the higher the calorific value of a gas the lower the efficiency in incandescent gas-lamps. A series of tests running over a year showed that the best results were to be obtained on water gas of about 450 B.Th.U., and the poorest upon gas of 700 B.Th.U. The results were entirely consistent throughout, and indicated that, within the limits stated, the lower the calorific value of the gas the higher the efficiency of the appliance."

THE GAS-FURNACE EXHIBITION AT SHEFFIELD.



THE exhibition of industrial gas-furnaces which is being held at Nursery Street, Sheffield, of which some account has already appeared in the "JOURNAL," continues to attract great attention in this important centre of the steel-working industry. Local manufacturers are manifesting much interest in the various novel appliances which are being shown for supplanting solid fuel by coal gas; and the enterprise of the Brayshaw Furnace and Tools Company, Limited, in promoting the exhibition, is receiving its due reward in the booking of orders. We have no doubt that the holding of the exhibition will result in a considerable increase in the sale of gas for industrial purposes by the Sheffield United Gaslight Company. The two views on this page are of the interior of the exhibition building—showing the various types of plant shown and the means employed for putting them to a practical test.

Among the principal exhibits is a furnace for annealing, heated by the Brayshaw patent burner. The chamber is 30 inches wide, 16 inches high, and 15 feet long. This is heated up from day to day, and works on an exceedingly small consumption of gas; while the temperature throughout is kept uniform without any difficulty. The atmosphere in the furnace is efficiently reducing, and, consequently, scaling of the steel is eliminated. An illustration of this furnace was given in the "JOURNAL" for Jan. 26 last, p. 189.

In addition, there are furnaces for hardening and tempering all classes of steel, which have been designed as a result of experience in connection with the manufacture of all kinds of steel pieces. Crucible furnaces are also shown, one with a tilting arrangement. Similar furnaces are in use all over the country for melting many different kinds of metals. The illustration shows a crucible furnace of the stationary type.

A number of furnaces for case-hardening, annealing, &c., heated by gas without air-blast are also on exhibition; and of these very complete ranges of sizes are made. Besides these, there are furnaces for forging, rivet heating, brazing, &c., as well as several resistance and thermo-couple pyrometer outfits, for indicating the temperatures of a number of the furnaces mentioned above.

Many experiments have been already carried out at the exhibition in connection with local manufactures; and we understand it is still the intention to continue this kind of work, in order to demonstrate the excellent results which can be obtained with properly designed gas-heated furnaces.

A list of furnaces, &c., on exhibition is appended; and attention

may be called to an extract from the last report of the Royal Mint, showing the actual success which is being attained there by gas heating with patent burners, which appeared in the "JOURNAL" for Nov. 3 last (p. 245).

List of the Principal Furnaces, &c., on Exhibition.

1.—Furnace for annealing, heated by Brayshaw patent burner as used in the Royal Mint, arranged for coal gas and air at a pressure of 1 to 2 lbs. per square inch, fitted with patent locking attachment to doors. Chamber, 15 feet long.

2.—Furnace for annealing, heated by burners working with natural draught. These burners are swivelling, and are fitted with dampers to enable the furnace to be closed to keep out air. Chambers, 16 feet long.

3.—Oven furnaces for case-hardening, annealing, &c., heated by natural draught.

4.—Furnace for case-hardening, annealing, &c., fitted with Brayshaw patent burner and patent locking attachment to door.

5.—Patent salt bath furnaces for hardening with mechanical precision.

6.—Patent twin-chambered furnaces for hardening high-speed steel, heated by Brayshaw burners and with special doors.

7.—Twin-chambered furnace for hardening, heated by natural draught.

8.—Patent crucible furnaces for melting, heated by Brayshaw patent burners and with special swivelling covers.

9.—Crucible furnace for melting, with tilting arrangement.

Crucible Furnace.

10.—Patent salt bath furnace with preheating chamber, for hardening high-speed steel drills, &c.

11.—Forging furnace for nut and bolt work.

12.—Brayshaw Meker furnaces for melting, annealing, case-hardening, forging, &c., arranged for air-blast heating and natural draught heating.

13.—Rivet-heating furnace.

14.—Brazing hearth.

15.—Furnace for cyanide hardening.

16.—Open baths for quenching.

17.—Tempering baths with strainers.

18.—Complete pyrometer installations.

19.—Milling cutters of carbon and high-speed steels.

20.—Patent milling cutter guard.

BOILER-FIRING BY COKE.

THE relative merits of coal and coke for boiler firing were discussed in a paper on "Mechanical Stoking" read by Mr. EDWIN KENYON before the South Wales Institute of Engineers, and contained in the number of the "Proceedings" of the Institute for January. We give below the portion bearing specially upon the subject mentioned above.

In the course of his introductory remarks, the author referred to the subject of smoke abatement as being inseparably associated with his inquiry; and he pointed out that, desirable as it undoubtedly is, from a health point of view, to have a restricted output in the manufacture of artificial clouds, it means to the steam user something beyond aërial sanitation. It means the recovery of so much wasted energy. Scientific investigation goes to prove that the evaporative power of 1 lb. of average English coal is 15·2; but if the volatile parts are allowed to go unconsumed in the form of smoke, the fixed carbon left would only be equal to an evaporation of one-half its estimated value. Since smoke is merely the "outward and visible sign" of inward prodigality, there is more in its suppression than meets the eye of the casual observer. He only sees the effect of a deep-rooted evil, which is not perceptibly diminished by the imposition of penalties for offences against the legal time-limit during which the emission of black smoke is allowed.

The author then remarks that a new body, known as the London Coke Committee, are endeavouring to induce factory owners to use coke or other smokeless fuel; and they report that, through the influence of their experts, who demonstrate how furnace and apparatus may be modified for the burning of coke, users of coal aggregating 50,000 tons per year, have been persuaded to adopt their suggestions. He offers the following remarks on their proposal: "Suppose the system thus advocated won anything like universal favour, to what extent would the available supplies from gas-works or coke-ovens have to be extended, if the demands of the textile trades only had to be met? The consumption of coal (almost entirely bituminous) will be somewhere in the neighbourhood of 60,000 tons per week for the Lancashire cotton-spinning mills alone, reckoned at the usual spindleage rate. Then, again, there is the well-known difficulty attending the ignition of coke or coke breeze, without intensifying the draught to the extent of carrying off minute crystals as they break away from the crackling fire—such as gleam on the pavement and we grind under our feet in any district where there happen to be blast furnaces."

Allowing the superlative advantage claimed for coke as a smoke preventer over other classes of fuel, similar, but far more economical, results may, in the opinion of the author, be obtained by what is known as the coking method of firing, which he described as follows: "It consists of piling every fresh charge of coal near the dead-plate, where ignition takes place and the hydrocarbon gases are given off. These are distilled while passing over the already incandescent fire. Thence the hot, gassy steam flows on, superheating the steam direct from the boilers, before taking the circuit of the flues, at the outlet of which its mission is fulfilled, by passing through the economizer, and raising the temperature of the feed water to something above boiling-point. Then only, cleansed of visible impurities, is it discharged through the chimney into the open air. In this way the coal is reduced to coke, which, in its red-hot state, is gradually pushed forward; so that by the time it reaches the far end of the grate its combustion is complete, leaving only ashes and clinkers by way of residual."

Contrasting the system above described with side-firing, in which the coal is alternately thrown to right and left—each side in turn becoming incandescent, and partially consuming the smoke of the other—Mr. Kenyon said the latter was, as might be imagined, not so readily manipulated, nor could it be quite so effective, as the steady push from the front, seeing that the flames must follow the direct pull of the draught, thereby losing some of the benefits afforded even by a restricted area of incandescence. On the other hand, expert opinion went to prove that, while evaporation more readily responds to the "spreading" or "sprinkling" of fuel over the entire grate, steam pressure is not so readily maintained, and smoke emission not held in check to the same extent as by either of the methods mentioned.

Coming to the subject of mechanical stokers, the author said their chief functions were to relieve the innate poverty of the baser sorts of fuel by regulating otherwise erratic supplies and accelerating laggard combustion by precision in air-feeding. They were almost as diverse in structural detail as methods of hand firing. The choice might, however, be said to rest between the two main principles embodied in the "coking" and "spreading" methods to which he had directed attention. The former appeared to lend itself most readily to effective mechanical treatment. He gave a description, with illustrations, of such a stoker, and also of spreading stokers. The "underfeed" stoker, a sectional sketch of which is given in the paper, might be said to represent a complete departure from the principle underlying any of the contrivances that had claimed attention. The sketch furnished some idea of the necessary alterations in the design of a furnace. Coal elevators were referred to by the author as useful and economical adjuncts to stokers, particularly when more than one boiler is in operation.

In conclusion, Mr. Kenyon remarked that, treating for the time being trade experiments as so many negligible quantities, we are left to approximate true results from the findings of actual practice. Years of efficient working more than confirm the modest claim of a 25 to 30 per cent. saving upon the initial cost of a thoroughly reliable stoker, particularly when the working parts are reduced to a minimum and are thoroughly accessible; and this on an ascertained life of from ten to fifteen years. All things considered, a substantial, well-used, mechanical stoker, must, in the author's opinion, prove a valuable asset to the steam user.

As already announced in the "JOURNAL," Mr. H. M. Thornton will read a paper on "The Industrial Uses of Coal Gas" at the ordinary meeting of the Royal Society of Arts on Wednesday, the 17th inst. Sir Corbet Woodall, D.Sc., M.Inst.C.E., will preside on the occasion.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Forty-Fifth Annual Meeting.

THE Forty-Fifth Annual Meeting of the Institution was held last Saturday, at the Grand Hotel, Manchester, under the presidency of Mr. J. G. NEWBIGGING, M.Inst.C.E., the Chief Engineer of the Manchester Corporation gas undertaking. Notwithstanding the war, and the extra duties now devolving on members of the gas profession working in co-operation with certain Government schemes, there was a good attendance. It was Mr. Newbigging's second year of the presidency—a fact which was brought about by the unsettled state of the country, caused by the war. At the October meeting, it was decided to re-elect the President and the other officers of the Committee *en bloc* for a further period of twelve months. Councillor Kay, the Chairman of the Manchester Corporation Gas Committee, was among those present, and had a hearty reception.

THE PRESIDENT'S WELCOME.

The PRESIDENT, in welcoming his colleagues, said they had every promise of a good meeting. This was very satisfactory, because it showed that they were not so depressed by the war as to be unable to carry on their ordinary Institution business as usual. This was as it should be; but they all realized the seriousness of the position, though he thought they could all look forward with confidence to a real and satisfactory outcome. He did not desire to further delay the progress of business by any words of his, but would ask them to take the first item on the *agenda—i.e.*, to confirm the minutes of their last meeting. He proposed to ask them to take the minutes as read.

The members agreed.

LETTERS OF APOLOGY.

The HON. SECRETARY (Mr. G. S. Frith, of Runcorn), after the minutes of the last meeting had been confirmed, informed the members that a number of letters of apology for non-attendance had been received. Mr. John Bond, the President of the Institution of Gas Engineers, had wired that he was indisposed; while Mr. Edward Allen was professionally engaged in London.

THE ANNUAL REPORT.

The PRESIDENT, in moving the adoption of the annual report of the Committee, said the financial position of the Institution was satisfactory. They had a credit balance; and during the year they had voted various sums to important funds. They had sent a donation to the Prince of Wales's Fund and to the Belgian Relief Fund, as well as to the Benevolent Fund of the Institution of Gas Engineers. There was also a contribution to the British Commercial Gas Association, and to the lectures at the Manchester University. With regard to the amount voted to the proposed housing of Engineering Societies in Manchester, the scheme was held-up owing to the war.

Mr. J. C. BELTON (Chester) seconded the adoption of the report, and also the statement of accounts for the year ended Jan. 31. [The accounts showed that the income for the year ended 1915 amounted to £167 7s. 6d., as compared with £170 13s. 8d. for 1914. The expenditure showed, for 1915, a sum of £143 10s. 11d., with a balance in hand of £24 15s. 7d., in comparison with £115 3s. 8d. and £55 10s. respectively.]

Mr. J. W. MORRISON (Sheffield) said that he noticed stationery and printing cost £25 odd, as compared with £15 odd. How had this come about?

The PRESIDENT: A good deal of the amount has been caused by extra expenditure in the sending out of advance copies of papers to the members.

The SECRETARY: And also a considerable amount of printing in connection with the education of gas-fitters. Papers have not previously been distributed to the members before a meeting.

Mr. MORRISON said he had pleasure in supporting the motion that the report and the statement of accounts be adopted.

This was unanimously agreed to.

The annual report was as follows:—

The Committee are pleased to report that the Institution continues in a satisfactory condition. The membership roll is 200—showing a decrease of one on the year. There have been five resignations. One has lapsed under rule 15; and the Committee regret to record the death of their esteemed colleague, Mr. Thomas Newbigging, D.Sc., M.Inst.C.E., one of the Founders of this District Institution, a Past-President, and for 31 years the Honorary Treasurer. They also regret to record the deaths of Mr. John Chew (Blackpool), a Past-President, Mr. S. S. Mellor (Northwich), who rendered good service for twelve years as Honorary Secretary, Mr. William Severs (formerly of Wilmslow), and Mr. J. T. Byrom (Corbridge). Mr. James Braddock (Radcliffe), also one of the Founders of the Institution, has been elected Honorary Treasurer, to fill the vacancy caused by the death of the late Mr. Newbigging.

After noticing the proceedings during the past year the report continued:

District Committees—viz., Lancashire, Yorkshire, Cheshire, and North Wales—have been appointed to assist in forming classes for gas-fitters wherever a demand may arise; and members are urged to support these Committees in their work. Examinations will shortly take place in Liverpool and Salford, where two most successful classes are being conducted. The Committee record their appreciation of the valuable services rendered by Messrs. H. Kendrick (Stretford) and E. H. Hudson (Normanton) in the promotion and development of the scheme of examinations for gas-fitters, which has now been recognized and adopted by the City and Guilds of London Institute. The annual reports of the Lancashire and the Yorkshire Commercial Sections have been issued to the members, and contain a valuable record of the useful work carried on by this department of the Institution.

Mr. W. Whatmough (Heywood) was unanimously elected representative of the Institution on the Council of the Institution of Gas Engineers. Mr. S. E. Halliwell (Littleborough) and Mr. F. H. Pickles (Kildwick) were appointed the representatives on the Council of the Lancashire and Yorkshire Junior Associations respectively.

The following sums have been voted during the past year: Prince of Wales's National Relief Fund, £10 10s.; Belgian Relief Fund £10 10s.; British Commercial Gas Association, £5 5s.; Benevolent Fund of the Institution of Gas Engineers, £10 10s.; Proposed Housing of Engineering Societies, £5; Lectures at the Manchester University, £15—total £56 15s. The finances of the Institution are in a satisfactory condition; the credit balance being £24 15s. 7d.

(Signed) J. G. NEWBIGGING, *President*.
G. S. FRITH, *Hon. Secretary*.

REPORTS OF THE COMMERCIAL SECTIONS.

The PRESIDENT said the members had already had the reports of the Commercial Sections. He did not know whether anyone had any remarks to make on them. If they had, now was the opportunity, although it did not come within their province to adopt the reports.

There were no comments; and the members passed on to consider the

RECOMMENDATIONS OF THE COMMITTEE.

Mr. H. KENDRICK (Stretford) moved that Mr. W. Whatmough (Heywood), one of the Vice-Presidents, be appointed the representative of the Manchester Institution on the Council of the Institution of Gas Engineers for 1915-1916. He said Mr. Whatmough had served them well in the past, and he was quite sure they could look forward to his good services in the future.

Mr. R. WATSON (Doncaster) seconded the motion, which was passed unanimously.

Mr. BELTON proposed, and Mr. E. H. HUDSON (Normanton) seconded, a proposition that a sum of ten guineas be granted to the Benevolent Fund of the Institution of Gas Engineers. This was cordially agreed to.

Mr. C. POTTS (Hyde) moved, and Mr. J. FURNISS (Slaithwaite) seconded, that the sum of five guineas be sent to the British Commercial Gas Association. This, also, was unanimously agreed to.

PRESIDENTIAL ADDRESS.

The PRESIDENT then delivered his Inaugural Address, which was as follows:

Gentlemen,—When I addressed you twelve months ago as your newly-elected President, I had little idea that I should occupy the position for a second year; and it was only because I felt that it would not be fair to ask Mr. Harman, my successor, to take up the duty during the critical times we are passing through that I consented to serve again. My occupancy of the office for another year affords me the opportunity of dealing briefly with some of the subjects which I was unable to do, for want of time, when last I addressed you.

EFFECTS OF THE WAR.

During the past six months the minds of those connected with the gas industry have been considerably exercised as to what effect the existence of the war is going to have on the balance-sheets of the respective undertakings they control, and how far it is possible to stave off an increase in the price of gas. Some undertakings have already raised the price, others are considering the question, and more will I fear have to take this disagreeable step before many months have passed over their heads. It is true that in some districts considerable increases in consumption have to be recorded—mainly because they happen to have industries in their midst which benefit from a state of war; but in a number of towns there is a serious falling off in consumption.

To add to this unhappy state of things, coal, which rose to an abnormal figure in 1912-1913, did not recover its normal price last year, and coke, tar, and sulphate of ammonia, taking them together, have fallen in value to an almost unprecedented extent. There appears at the moment no prospect whatever of any reduction in the price of coal this year, but rather, owing to a shortage of men, the high price of pit timber and stores, and other results of the war, the tendency is upward.

Difficult as it is with the present price of coal and lessened

value of residuals to make ends meet, a more serious menace confronts us next winter if the war should unfortunately continue so long; and that will be the difficulty in securing adequate supplies of coal. It is to be hoped that the conference which was held in the earlier part of the month in Manchester (at the call of the Chairmen of the Manchester and Salford Gas Committees), to consider the question of coal supplies, will result in some relief being secured in this direction. There can surely be no objection, from any of the parties concerned, to the suggested suspension of the limitation to eight-hours working in collieries for the duration of the war, which in the case of many of them would result in an increased output.

Another important matter which is causing concern to gas engineers at the present time is whether they should continue as usual to expend money in extending and improving their plant, or stay their hand until peace is declared. Necessarily the individual circumstances of each case must be considered on its merits; but unless one is in a position to postpone work of this character for an indefinite period, there will be nothing saved in expenditure. The delay of a year or two will make no difference in cost. Iron and steel are rapidly rising in price, and other constructional material will follow; and it is impossible to say how many years will elapse before normal prices are reached. In these circumstances, so far as the Manchester Corporation Gas Department is concerned, we are proceeding with such work as usual, and have recently let a large contract for the reconstruction of carbonizing plant—having come to the conclusion that nothing will be gained by postponement.

PROVISION FOR ELASTICITY.

Those undertakings where large reserve or other funds have been accumulated which they are able to draw upon to meet such a crisis as we are passing through, have reason to congratulate themselves on their foresight; but even those best situated in this respect will have difficulty in weathering the storm without raising the price of gas. The present situation is, of course, unparalleled, and one that we hope no living person will experience again. But it provides many lessons, one of which is applicable to the gas industry, and that is, the necessity of adequately providing against a rainy day.

Anxious as we all are to sell gas at a low figure for the mutual benefit of our consumers and undertakings, a reduction in price should not be made unless we are assured there is sufficient elasticity left in the undertaking to maintain such reduction. There are few things which so adversely affect the sale of gas and bring discontented consumers as a fluctuating price—up and down with every turn of the tide. Particularly is this the case where gaseous fuel has been adopted in place of solid fuel for industrial purposes on an extensive scale, and where the margin between the local prices of the two fuels for a given amount of work is small. The greater confidence we can inspire in the minds of our consumers that once a reduction is made in the price of gas, it will not be again raised, the greater will be our chances of success in permanently displacing solid with gaseous fuel.

In the financial control of gas undertakings too little attention is given in many cases to the provision of adequate reserves in some form or other—large enough at all events to tide over a few bad years without raising the price of gas. Companies seeking new powers in Parliament in these days are given every facility and encouragement to strengthen their concerns in this respect, as a study of the financial provisions in the "Model Bill" show; and municipalities have practically a free hand.

In fixing the price of gas it is not sufficient to only provide out of revenue for the expenditure on coal, manufacturing and distribution costs, and interest and sinking fund or dividend charges as the case may be. In addition, it is necessary that the works and plant should be liberally maintained—not starved, as is sometimes the case—and a renewals fund built up year by year on a depreciation basis. The practice of simply relying on any balance which may be left after the ordinary charges are paid to meet expenditure on renewals, is too precarious.

The advantage of making adequate provision is that in critical periods not only can the accumulated fund be drawn upon to adjust finances, but a temporary suspension of the annual contribution resorted to until the advent of more prosperous times. In many instances undertakings have to postpone the introduction of new systems of carbonizing or other processes to displace existing out-of-date plant, which may not be actually worn out (but from scrapping which large savings would accrue), simply because they have been working the concern too near the bone, and have no funds to fall back upon for this purpose.

It is in the attention to these important matters that the essential elasticity of a gas undertaking is provided for, which enables it to temporarily bridge-over difficulties. I may be repeating common-place truisms; but, unless they are dinned into our ears from time to time, we are apt to overlook them in our anxiety to reduce the price of gas to an extent we may find ourselves unable to maintain.

The suggestion that relief from the present situation should be secured in the case of municipalities by temporarily suspending the annual payments to their sinking fund accounts (which, I understand, was originally made by the Borough Treasurer of Accrington at the commencement of the war), is not one which I think we can look upon with favour excepting as a last resort. I believe, however, that such a policy is not without precedent.

In the case of many municipal gas undertakings, the suspension of the usual contribution in aid of the rates would entirely obviate an increase in the price of gas. I do not propose to dwell on this question; but in common justice to gas consumers, it is not one of those sources of relief from the necessity of raising the price of gas which can be dismissed without consideration.

To raise the price of gas at the present juncture, simply for the purpose of continuing these contributions, thus throwing the whole burden on the consumer, would be an absolute refutation of the contention that the general body of ratepayers have anything at stake in municipal gas enterprise which justifies the appropriation of large sums out of gas profits.

It is to be hoped the day is not far distant when the tax will be limited, in a General Act if possible, to 1 per cent. on the outstanding debt, and that this will be the forerunner of its total abolition.

MANUFACTURE OF ANILINE DYES.

The project which has been so much discussed in the Press during the past few months, as to the ways and means to be adopted to capture the manufacture of dyestuffs from the Germans—an industry which they have made through ability and application peculiarly their own—is of particular interest to us. As is well known, the manufacture of aniline dyes has hitherto only been conducted in this country on a comparatively small scale. If this trade is to be increased to the extent which it is desirable it should be, the gas industry will benefit; and I am sure we are not simply going to collect the benefits without giving a helping hand to the scheme in any practicable direction that may be indicated to us. How far the industry can help forward the movement it is difficult to see. Whether the undertaking of the distillation of their own tar by large gas-works, and the combination of smaller ones with the same object, would result in economies is somewhat problematical. Certainly a study of the figures in "Field's Analysis" of the returns of gas undertakings distilling their own tar and those selling it in the crude state, does not give any encouragement in this direction. Still, we shall not I am sure be slow to avail ourselves of any hint that may be thrown out to us to help in this movement, which is of such importance to the nation.

The important point to consider is as to the position of the scheme when the war is concluded, and the two countries, Great Britain and Germany, resume their trading relations on which they are so interdependent, because I should think no one will assume that this war, terrible as it is, will render future trading between the two countries impossible. It appears obvious that the only way to ensure the success of such a scheme is the loyal support of the users of dye-stuffs in this country, and the imposition of a tariff on foreign importations which has been suggested.

THE CALORIFIC STANDARD.

The formal recognition by Parliament of the calorific standard in substitution for the illuminating standard, as evidenced in the proceedings on the Gas Light and Coke and Liverpool Gas Bills in the last session of Parliament, and by its inclusion in the latest draft of the "Model Clauses," marks another important step forward in the gas industry.

The illuminating standard was never entirely satisfactory, because no instrument has been devised by means of which a continuous record of the illuminating power of gas could be taken, as in the case of its calorific power, which is of such value in regulating the quality of the gas distributed. But apart from this, the great change in the systems of carbonizing coal and methods of consuming gas rendered the introduction of a new standard imperative, if the most economical results are to be obtained from a ton of coal; and there is no better criterion of the value of gas than its calorific power, excepting its composition. The time is not yet ripe, however, for a standard of composition, though some day it may be that the value of gas distributed will be measured by the fixing of an allowable maximum of incombustibles.

I fail to see the soundness of the argument which has been put forward that a different standard should be fixed for different districts. The contention that local coal supplies should regulate the calorific power to be applied to any particular district is outweighed in favour of a national standard, in view of the necessity of standardizing all gas-consuming appliances. The room for difference of opinion lies, of course, in *the* standard to be fixed, and whether it should be with or without a working margin.

Suggestions have been made that as low a calorific standard as 300 B.Th.U. should be adopted, with a corresponding reduction in the price of gas. But it must be remembered it is not entirely a question as to how many heat units are given for a penny, but rather in how many cubic feet these units are contained. For example, it could not be said that for most purposes 2000 cubic feet of gas of 270 B.Th.U. per cubic foot at 1s. per 1000 cubic feet are equal in value to a consumer as 1000 cubic feet of gas of 540 B.Th.U. per cubic foot at 2s. per 1000 cubic feet. The objection to the use of low-heating value gas is, of course, the larger volume it is requisite to consume to secure equivalent results to those obtained with a higher value gas, and the cost of altering supply pipes, meters, and consuming appliances. In the interest of both producer and consumer, there are economical limits in heat value both up and down, within which the standard must be fixed. This is the point which has to be determined by careful consideration; and it is one that cannot be hastily decided.

The fixing of a standard without a working margin would be no hardship to those engineers who have adopted continuous carbonization, because anyone with experience in this system knows how

easy it is to keep the calorific power close to any desired figure; and it is remarkable what large yields of gas per ton can be obtained while at the same time maintaining a high calorific power. Although the unsaturated hydrocarbon content is reduced, and consequently the illuminating power, the minimum of incombustibles produced leaves the calorific power very little affected over a wide range of yields of gas per ton of coal.

In selecting his standard instrument, it behoves the engineer to have a calorimeter which, in addition to being accurate, is so constructed that the sources of error are few in number, and it should be easy of manipulation and give the maximum value obtainable from the gas.

We have all heard of the Total-Heat Calorimeter, and many no doubt use it. But my experience of its value compared with other well-known types has not so far been favourable; certainly I have not found the claim justified, "that it is to ordinary calorimeters what the No. 2 'Metropolitan' argand burner is to other argand burners."

With a view to testing the accuracy of this statement, I have had one of these instruments working side by side for some months with a Boys calorimeter, on which a long series of tests have been carried out by an operator who knows his work; but so far the results obtained do not justify the claims made for the instrument. The following figures are the averages of the tests:—

Boys Calorimeter.	Total-Heat Calorimeter.
561·8 B.Th.U. gross.	554·8 B.Th.U. gross.

As will be seen, there is a difference of 7 B.Th.U. in favour of the Boys calorimeter.

On only two occasions have we found the Total-Heat Calorimeter giving a higher result. On one occasion it gave 1·5 B.Th.U., on another 3·6 B.Th.U. higher. The tests were run from the same service pipe at the same time; and to ensure that there should be no meter error, the meter was changed-over frequently, in addition to being regularly standardized by means of the $\frac{1}{2}$th cubic foot standard bottle.

COMPOSITION OF GAS.

The question of the composition of the gas as it is being made has not received the attention the subject deserves. The aim of the engineer should be to produce a gas which is as nearly constant in its composition as practicable; and although one should strive to obtain as large a make per ton as possible, without, of course, unduly reducing the calorific value, yet this object should not be obtained by over-exhausting.

The regular analysis of the gas can be of considerable use to the engineer, and this knowledge will enable him to use the retort-house governor to the best advantage. The following series of analyses show how the quality varies under very slightly different conditions. The samples were taken at the inlet to the retort-house governor, and represent the gas produced from the closing of the last lid after charging, to a few minutes before the commencement of the next charge. The first set of figures are with the gauge showing $\frac{1}{10}$ inch pressure; the second series with the gauge level; in the third series the gauge showed $\frac{1}{10}$th vacuum. The value of this table would have been enhanced could I have given you the yield of gas per ton under the different conditions; but this was not possible owing to the retort-houses being at work, and the difficulty of registering separately the gas from this particular retort-house under test. In some future tests, I hope to be able to do this. But the point I wish to emphasize here is the value of continuous analysis of the gas as it is being produced. Without such analysis, no one would suspect that $\frac{1}{10}$th pull on the exhauster, compared with level gauge, would increase the percentage of incombustibles by more than 30 per cent.

The foregoing figures demonstrate, in a very striking manner the value of systematic gas analysis as a guide to the work of carbonizing.

AMMONIA.

In my address last year reference was made to an investigation that was carried out at our Bradford Road works in the conservation of the ammonia produced during carbonization and retaining the same in the form of ammoniacal liquor. The improved results then recorded have been more than maintained, and are as follows:—

Gallons per Ton of Coal Carbonized.

	10 oz. Ammoniacal Liquor.
Average for five years (1908-12) . . .	29·84
Average for 1913	32·42
Average for 1914	32·68

No doubt it will be of interest, and serve a useful purpose, if I detail the system adopted in recording our results.

The storage wells have been accurately calibrated, and measurements are taken at 2 p.m. each day. The water used for flushing the hydraulic mains and the water used for feeding the washer-scrubbers are measured separately, and to make the record complete the coal carbonized, together with the tar and liquor sold, are entered daily in a book ruled thus:

Date.	Coal Carbonized.	Tar Sold.	Liquor Sold.	Liquor Stocks.	Tar and Liquor Made.		Less Tar Made. Average for Previous Quarter. Gallons per Ton.	Liquor Made.
					Galls.	Glls. per Ton.		
	Tons.	Galls.	Galls.	Galls.				Galls.
—	650	9000	30,000	750,000	30,500	47	11·5	35·5

Gallons 10 oz. Liquor per Ton (Average for Previous Quarter).	Approximate oz. Strength of Liquor Made.	Water Used.				Outlet or Scrubber. Grains NH_3 per 100 Cubic Feet.
		Hydraulic Main.		Scrubber-Washer.		
		Total Gallons.	Gallons per Ton.	Total Gallons.	Gallons per Ton.	
32·7	9·2	6500	10	5590	8·6	*Nil* to slight traces

The results tabulated are not for any specific day, but may be taken as a fair average working record.

Typical Analysis of Air in Liquor Wells which are Fitted with an Efficient Cover.

	Per Cent.
Ammonia compounds	0·60
Oxygen	19·14
Nitrogen	79·05
Hydrocarbons	1·21

Samples of Gas Taken from the Foul Main at the Inlet to the Retort-House Governor.

	Carbonic Acid.	Oxygen.	Illuminants.	Carbon Monoxide.	Methane.	Hydrogen.	Nitrogen by Difference.	Total Non-Combustibles.	Calorific Value in B.Th.U. per Cub. Ft.	
1	3·50	0·50	5·80	7·50	39·36	38·57	4·77	8·27	677·1	Gauge showing 1-10th pressure
2	3·50	0·30	5·60	7·30	37·27	36·60	9·43	12·93	644·6	
3	3·40	0·30	4·90	7·40	35·28	40 11	8·61	12·01	620 0	
4	3·40	0·60	4·60	7·80	33·44	41·26	8 90	12·30	599·5	
5	3·60	0·40	4·20	7·80	32·59	42·13	9·28	12·88	584·5	
6	3·50	0·30	4·00	7 80	31·81	44·67	7·92	11·42	580·2	
1	4·70	0·50	3·80	8 10	27·52	38·66	16·72	21·42	513·9	Gauge level.
2	4·20	0·20	3·20	8·00	24·39	39·56	20·45	24·65	471·5	
3	5·00	0·80	3·10	7·00	25·87	36·67	21·56	26·56	471·5	
4	5·30	0·60	2·90	7·60	23·59	39·10	20·91	26·21	453·7	
5	5·30	0·70	2·80	7·40	23·80	36·20	23 80	29·10	443·6	
6	5·30	0·90	2·90	7·30	23·51	35·07	25·02	30·32	439·0	
1	4·20	4·60	2·60	5·70	21·88	27·39	33·63	37·83	385·9	Gauge showing 1-10th vacuum.
2	4·40	1·60	3·60	6·10	25·38	33·85	25·07	29·47	466·3	
3	4·80	1·40	3·00	5·70	22·46	33·35	29·29	34·09	420·1	
4	4·90	2·00	2 90	5·90	20·60	33·09	30·61	35·51	399·0	
5	5·20	2·40	2 60	5·40	19·38	31·44	33·58	38·78	372·9	
6	5·30	2·60	2·40	5·50	17·95	32 03	34·22	39·52	356·1	

The retorts from which the above samples were taken are horizontals worked with a dry main; the main being sealed during the time occupied by drawing and charging. The retorts are charged with a Fiddes-Aldridge machine. The first samp e was taken immediately after closing the last mouthpiece lid after charging; the remainder at intervals of about 25 minutes—the last sample being taken just prior to sealing the main in readiness for the next charge.

The following table is useful as showing the composition of the liquor from various parts of the plant:—

Analyses of Ammoniacal Liquor from Various Parts of the Plant.

[All Results Given as Grains per Gallon.]

—	Results Stated as.	From Hydraulic Main.	Condensers.	Washers.	Scrubbers.
Ammonia free . .	NH_3	125	1708	1922	1464
,, fixed . .	NH_3	625	137	70	15
,, total . .	NH_3	750	1845	1992	1479
Carbonic acid . .	CO_2	62	1532	1968	1642
Chloride	HCe	1363	311	219	171
Sulphur.					
Total	S	77	548	626	604
As sulphate . .	S	7	0·86	0·96	0·86
As sulphides . .	S	23	473	544	497
As thiocyanate .	S	—	49	18	32
As sulphite and thiosulphate (by difference) . .	S	—	25	63	74
Thiocyanate . .	HCN	—	41	15	27
Ferrocyanide . .	HCN	—	16·5	4	2·5
Ounce strength . .	—	4·9	12·1	13·0	9·7

Should we desire to further increase the strength of the well liquor, the system of circulation of the hydraulic main liquors as advocated by "Modus Operandi" in the "JOURNAL OF GAS LIGHTING" for March 24, 1914, when commenting on my last address, would have the desired effect, and is receiving my careful consideration.

SULPHATE OF AMMONIA.

The recent collapse in prices of sulphate of ammonia is engaging the serious attention of manufacturers, and special consideration is being given to the process of manufacture, the package, and the conditions of sale.

The reason for this drop in prices is very clearly stated in Messrs. Bradbury and Hirsch's excellent "Review of the Market for Sulphate of Ammonia during 1914." German makers feeling the need of extending their markets lowered their prices accordingly; and we learn from an unsolicited letter received by a firm in this country from an American house, and sent out by the Sulphate of Ammonia Association, that, "in spite of the superior condition of the German sulphate of ammonia the price of this product was as low as, *and in a great many instances lower* than, the British make." To combat this competition—which though eased for the time being will undoubtedly be resumed at the close of the war—the Sulphate of Ammonia Association strongly advocate the manufacture of high testing sulphate of ammonia; the standard advised being 24¾ to 25 per cent. ammonia, with not more than 3 per cent. of moisture and ½ per cent. of free acid.

I am convinced that the moisture and free acid contents are safe ones, because about five years ago we had returned to us a 2-cwt. bag of sulphate that had missed being shipped. It bore signs of rough handling; and in order to observe the effect of the sulphate of ammonia on the texture, it was kept for twelve months and then thoroughly examined by dropping the bag on the floor from a height of 5 feet, and subjected to other rough treatment. The analysis of the sulphate as originally packed was 3·2 per cent. of moisture and 0·5 per cent. of free acid. The bag stood the test so well that it could have been sent out with a fresh delivery. The bag in question was a once-used second-hand heavy twill bag weighing 2·6 lbs. The large variety of second-hand bags on the market necessitates careful discrimination to ensure the parcel reaching its destination in a satisfactory condition.

While agreeing with the moisture and free acid content advised by the Sulphate of Ammonia Association, I am not entirely convinced either of the wisdom or the demand for a high-testing sulphate. Selling price is an all-important factor; and it is self-evident that a 24 to 24½ per cent. sulphate can be offered at a lower figure than the 25 per cent. product on the basis of its ammonia content alone. Further, the purity of the acid required for the manufacture of the higher testing sulphate goes considerably to increase the cost of production, while with a lower-grade acid, made from spent oxide, a good white salt can easily be obtained at a correspondingly lower cost.

The demand for high testing sulphate can easily be tested by offering for sale a parcel of 25 per cent. ammonia and a parcel of 24 per cent. ammonia; and I venture to say that if such a course is adopted, the offers obtained will hardly justify the expectation of a demand for the higher quality.

For home consumption, Mr. John West, in his valuable paper, on "Lime and Sulphate of Ammonia as Fertilizers and How to Increase their Sale," read before the Institution last year, recommends mixing the sulphate with earth or fine sand, and selling at a lower price and on a guaranteed percentage of nitrogen. His recommendation is to lower the percentage of ammonia for the reason that a small quantity is used over a large area.

IRREGULAR ELECTRICITY CHARGES.

The disclosures which have been made in the Long Eaton, South London, and Ilford cases, as to the preferential treatment of consumers by electrical concerns, are interesting reading; but it is satisfactory that an exposure has been made at last.

There has been nothing stronger to prove the reasonableness of my contention twelve months ago—as to the necessity of some co-operation between municipal gas and electricity—than these three cases. That it is possible for an electricity department by unfair methods to gradually undermine the business of a gas undertaking, both of them under the same public ownership, cannot be calmly contemplated. If it is not advisable to go as far as I advocated in the joint management of such concerns, at any rate to the Finance Committee, or some other Special Committee, should be relegated the duty of seeing that the charges for both gas and electricity are in order, and that full schedules of such charges are published for the information of consumers. There is far too much secrecy and private bargaining with customers by electrical undertakings to give any confidence that the prices are always strictly based on the load and diversity factors, and that they have not some ulterior object in view.

We cannot complain of fair competition; but we do object to methods of trading which correspond to German ideas of warfare. It behoves all gas undertakings to look carefully into the working of the electrical undertakings in their own towns, and if illegalities are being committed to bring immediate action against them.

In concluding my brief and somewhat discursive address, I do so with the hope that when the time comes round again for our next annual meeting we shall meet under happier conditions in National affairs than unfortunately exists to-day.

Mr. E. A. HARMAN (Huddersfield), the Senior Vice-President, met with an enthusiastic reception on rising to propose that their best thanks be given to the President for his address. It needed, he said, no words of his to commend the proposal to their enthusiastic support. There were so many useful hints in the address that they would all reflect on it with profit.

Mr. MORRISON, in seconding, remarked that, by reason of the unique position which Mr. Newbigging enjoyed as President for two successive years, he had been enabled to give them two addresses in that time. It seldom fell to the lot of any president to do likewise. He was, however, rather sorry that Mr. Newbigging had not dealt with the question of toluol, as the suggestion of the Government that gas undertakings should assist them by providing high explosives for warfare was a most important matter. Possibly Mr. Newbigging's modesty had not allowed him to touch the question. The address was a very able one.

The proposition was carried unanimously.

The PRESIDENT said he was very much obliged to the members for the kind way they had received his address. He need hardly assure them that he was always pleased to do anything to help forward the work of the Institution. Mr. Morrison had said that he might have dealt with the recovery of toluol. As a matter of fact, they were already carrying out some experiments in Manchester; but they were not concluded in time, or he would have been able to give them the results. It was necessary to go over the experiments several times before being sure of one's figures. This was the reason why he had not mentioned the question of toluol as one of the topics in his address.

MECHANICAL TRANSPORT OF COKE.

Mr. R. E. GIBSON (Liverpool) read a paper entitled "Mechanical Transport of Coke—Comparative Efficiencies and Costs," which, with some remarks thereon, will be found on pp. 511-15.

MAINTENANCE OF GAS APPARATUS.

Mr. H. KENDRICK (Stretford) afterwards read a paper on the "Maintenance of Gas Apparatus." This is given on pp. 515-19, together with some of the remarks made upon it.

On the conclusion of the discussion (at a very late hour),

Mr. HUDSON proposed a vote of thanks to Mr. Gibson and to Mr. Kendrick for their papers. He said it was exceedingly good of them to go to the trouble of preparing papers at times like this, when they were all to some extent affected by the war, as well as by the requirements of the authorities for toluol and other constituents for making high explosives. For this reason, therefore, their thanks were due perhaps more than in the ordinary sense. Mr. Gibson's paper would stand as a very valuable addition to their "Transactions." He need not "paint the lily" in rendering to Mr. Kendrick their thanks. They knew he was thorough in his work,

Mr. WATSON seconded, and

The PRESIDENT cordially endorsed the remarks made,

Mr. GIBSON and Mr. KENDRICK briefly returned thanks, after which the members took tea together.

Sensitiveness of Selenium to Light.—At a recent meeting of the Société Chimique de France, M. Louis Ancel described experiments he had made with selenium with a view to its use in photometry to examine various radiations. According to a notice of his communication in the "Revue Générale des Sciences" for the 30th ult., the combined action of heat and pressure makes it possible to obtain a variety of radium particularly sensitive to light, and the inertia of which is very low when the conductive metal supports are judiciously selected and sufficiently close. At the time of spreading the selenium by his process, M. Ancel states that a very small quantity of metallic selenium is formed which seems to act as a sensitizer. It appears to be suitable not only for photometric observations in astronomy, but also for the study of radiation from radio-active substances.

MECHANICAL TRANSPORT OF COKE:

COMPARATIVE EFFICIENCIES AND COSTS.

By R. E. GIBSON, of Liverpool.

[A Paper read before the Manchester District Institution of Gas Engineers, Feb. 27.]

The extensive adoption in recent years of machine-stoked horizontal and of vertical retorts has rendered some form of expeditious coke transport necessary in order to deal effectively with the rapidly discharged coke. With systems of coke transport, the great Darwinian theory of the "survival of the fittest" will hold good, as it will also in respect to systems of carbonizing and other matters. It would appear that the time is now opportune for an inquiry as to which system of coke transport is the "fittest;" and the author presents this paper in the hope that it will help to focus attention upon a subject which is of growing importance.

Many systems of coke transport are now in successful operation. The two systems which appear to be in the greatest favour are the hot-coke conveyor (trough and endless-chain type), and the telpher. The author proposes to make a comparison of these and two other systems of coke transport now working successfully in Liverpool. The four systems which will now be compared are:

1.—Steam jib crane on gantry.
2.—Telpher.
3.—Temperley transporter.
4.—Hot-coke conveyor.

Each of these systems has its limitations and advantages, and each may be specially suitable for a given set of local conditions. Local circumstances may, therefore, be sufficient to turn the balance in favour of one system or another.

Before dealing with comparative efficiencies and costs, it will be well first of all to consider the general merits or demerits of the four systems—keeping in mind the fact that the main functions of the machine are to receive and convey the freshly-discharged coke from the retort-house, elevate it to a suitable height, and deposit it in a receiving hopper, for screening, breaking, sorting, or storing purposes, or to deposit it on the stock heap as the case may be. The process of quenching is in some cases also incidental to the handling of the coke, and must be taken into consideration.

1.—JIB CRANE AND GANTRY.

The steam jib crane on a gantry is a comparatively old method of handling and stocking gas-works materials. The late Mr. John Woodward persistently advocated its use many years ago, and introduced a combination of crane and gantry in which the crane was mounted on a radial arm, and was capable of moving radially over a circular track. For stocking purposes, and especially for coal, this arrangement gave facility for covering a very large area of ground, and to a considerable height, at small cost. For some reason or other the steam jib crane and gantry has not generally been considered suitable for handling and stocking coke, and other means have been employed where the crane would have done the work more efficiently and economically.

This plant can be used most effectively when it is arranged to pick-up skips at a fixed point—say, immediately outside the retort-house—and dump their contents, either into a fixed receiving hopper, reached by turning the jib radially only, or on to any part of the stock heap by also travelling along the gantry. The jib crane is particularly suitable for stocking purposes, as the long reach and height of the jib make it possible to cover a large area and build-up an extensive and high stock of coke with ease and at small cost.

The steam crane is an efficient and simple machine, quick in action, with low cost of maintenance and low cost of power; coke, of which there is usually a plentiful supply on gas-works, being used in the boiler. Moreover, ordinary skill and attention, such as are available on nearly every gas-works, are all that is needed to keep it in good working order.

The gantry may be cheaply constructed in reinforced concrete, which material is particularly suitable for the purpose, as the surrounding coke has no deteriorating effect, and no painting is necessary. Even where a very high stock heap is required, the gantry need not be very high, as a long jib on the crane will give a large share of the required elevation. The chief limitation of this system of coke-handling is that it cannot be used conveniently for picking-up skips immediately in front of the retorts. Another objection which may be raised against the steam-crane is that if the crane were out of action for the purpose of repairs or boiler inspection, it would be necessary to revert to hand labour, or "idle" the retorts. Such occurrences are very infrequent and in a small or medium-sized works, need not present any difficulty. In a large installation, however, where a stoppage might be a more serious matter, the difficulty may be obviated by the provision of a spare crane, and siding. Although this would involve an additional capital outlay, the total cost would still be well below that of other systems of similar capacity.

2.—TELPHER.

The telpher system has rapidly gained in favour in recent years; two great advantages being that (1) it can be run into the retort-house, and can pick-up skips at any point along the front of the bench, and (2) the track may be taken round curves as required, and, if desired, formed into an endless track. Where great capacity or speed of working is necessary, two machines may be run on one track; and in large installations it is always desirable to have a spare machine, so that in the event of one failing the other would be available for carrying on the work.

The capacity of the telpher for stocking is limited by the fact that the skips can only be discharged immediately under the line of the track. The telpher also requires a comparatively high structure, as the machine and skip hang from, and below, the track. The steel trestles and girders for carrying the track, being built-up of light sections, and subject to the corrosive action of the coke and the weather, need special attention in respect to painting. At Linacre it has been found necessary to encase the legs of the trestles in concrete, to protect them from the corrosive action of the coke. It is clear that reinforced concrete would be a more suitable material for the trestles; but the greater cost of constructing so lofty a structure in this material has hitherto stood in the way of its adoption.

In regard to maintenance, the track rail (round the curves especially) has to be renewed occasionally, and the repairs to the machines amount to a considerable sum. These items, together with the cost of lubrication and the painting of the structure every two years, make the cost of maintenance rather heavy.

One advantage which this system possesses, is that the driver has a good view of his work, as he travels along with the machine. Improvements have been recently effected in the design of the telpher, such as the use of the swivel bogey and improved switches for the track. There is one direction in which there is room for further improvement—*i.e.*, the elimination of noise in lowering the skip and in travelling round corners.

3.—TEMPERLEY TRANSPORTER.

Two installations of this well-known system are working very satisfactorily at Liverpool for handling coke. The plant consists mainly of a long, straight inclined track joist, on the bottom flange of which runs a carriage from which hangs a Temperley auto-

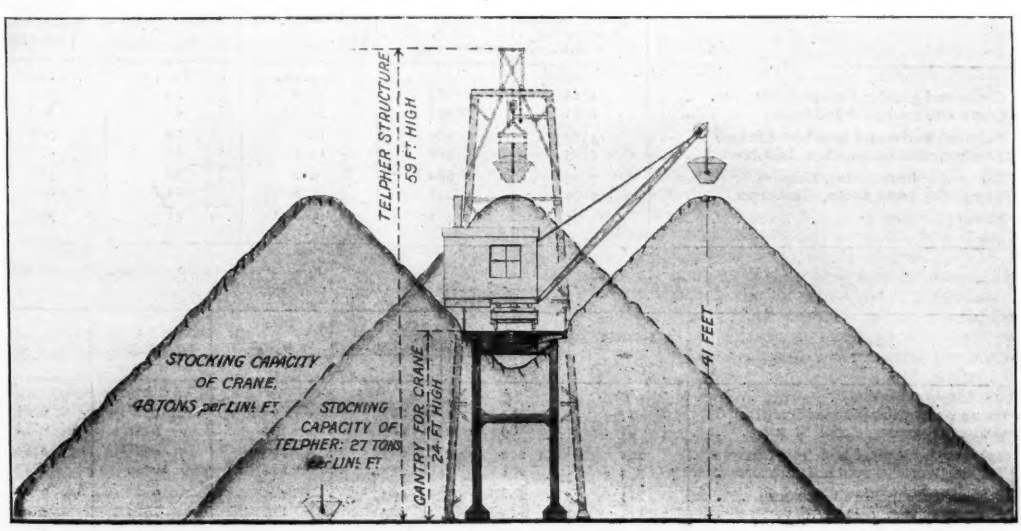

TELPHER STRUCTURE 59 FT. HIGH
STOCKING CAPACITY OF CRANE, 48 TONS per LIN. FT.
STOCKING CAPACITY OF TELPHER: 27 TONS per LIN. FT.
GANTRY FOR CRANE 24 FT. HIGH
41 FEET

DIAGRAM SHOWING THE COMPARATIVE STOCKING CAPACITIES AND HEIGHTS OF FIXED STRUCTURES OF THE TELPHER AND CRANE-GANTRY.

matic dumping fall-block. The carriage is hauled along the beam, and the fall-block is lifted or lowered by means of steel-wire ropes carried over pulleys to the drum of an electrically driven winch. The driver, in a fixed "crow's nest" controls all the operations of lifting, travelling, lowering, and tipping.

This system is limited to a straight track only, and cannot be taken round curves. Where the site permits, however, it can be run through the retort-house and arranged to pick-up skips in front of the retorts at any point in the length of the house. One advantage it possesses is that the height at the receiving end is low, while that at the delivery end is high; so that the time taken up in lifting is very small, while the greater height at the other end gives greater stocking capacity.

In the opinion of some, the Temperley machine has another advantage in the fact that the driver is stationary, and is able to control the position of the skip accurately by means of an indicator in his cabin. As in the case of the telpher, the skip can only be discharged under the line of the track—thus limiting its stocking capacity.

4.—Hot-Coke Conveyor.

Conveyors of the De Brouwer, West, and other similar types are now used in so many places for the removal of hot coke from the retort-house that their convenience and usefulness may be said to be well established. While they have some valuable advantages not possessed by any of the three systems previously referred to, they have also disadvantages which are of a serious nature. One feature of the system, rendered possible by the fact that the coke is carried along a trough, is the ease with which the coke can be quenched by means of a sprinkler over the trough. In the three systems previously mentioned, the coke must of necessity be quenched while it is in the skip, unless it is so quenched or cooled before reaching the skip as not to require further treatment.

Another feature worthy of note is that the hot-coke conveyor is a continuous machine, and always ready to receive the coke; while the three other systems are intermittent. It is doubtful whether this attribute can be considered an advantage, as retorts, whether of the horizontal or vertical continuous type, are always discharged intermittently, and the conveyor, unless it is fully employed, will be either standing still or working without load part of the time, and therefore wastefully. It is obvious that the power required to drive a hot-coke conveyor, and the wear and tear, must be very considerable, when one considers the gritty nature of the material dealt with and the large amount of friction which must take place between the chain, the coke, and the bottom of the trough.

A test made on an ordinary push-plate conveyor for coal revealed the astonishing fact that 99·13 per cent. of the total brake horse power used was expended in overcoming the friction of the moving parts and the friction of the load; while the transport of coal could have been effected, under ideal conditions, by an expenditure of 0·87 per cent. of the total power used. It is reasonable to suppose that there would be a similar relation between the power required to overcome friction and the power required to do useful work in the case of the coke conveyor. It should be said, however, that the makers of one well-known conveyor of this type have given special attention to the design of their chain, so as to reduce friction as far as possible.

The hot-coke conveyor is unsuitable where a great height is required for stocking purposes, on account of the large amount of power needed to drive it at a suitable angle and long enough to reach the required height, and on account of the damage done to the coke by falling from that height. Its stocking capacity, moreover, is limited to the line of the conveyor. Other objections which have been raised are that the coke is unnecessarily broken in its travel along the trough—an unduly large proportion of breeze and dust being produced—and in case of a serious breakdown of the plant hand labour would have to be resorted to, or the retorts would have to "idle." Notwithstanding its disadvantages, the hot-coke conveyor is a very convenient means of expeditiously removing the hot coke as it falls from the retort, and of carrying it outside the retort-house. This it will do with very little attention; whereas in each of the three systems previously referred to, the full attention of a man is required. Thus there is a saving in labour.

Bases of Comparison.

To obtain a fair comparison of the four systems, it will be necessary to go more closely into the capacities, efficiencies, and costs of actual installations; and for this purpose the accompanying tables have been prepared. In the case of Installations Nos. 1, 3, 4, 5, and 6, the information has been gathered from actual experience at Liverpool. Installation No. 2 is not yet erected, but is now in hand. The figures relating to this plant are

Table I.—*Capital Cost and Stocking Capacities.*

—	Capital Cost. (1)	Maximum Working Capacity. Tons per Hour. (2)	Capital Cost per Ton per Hour. (3)	Height Lifted. (4)	Stocking Capacities. Per Lineal Foot of Track. (5)	Stocking Capacities. Total. (6)
	£		£	Feet.	Tons.	Tons.
1. Crane and gantry, Eccles Street	774	15	51·6	34	33	4,000
2. Crane and gantry, Athol Street	906	20	45·3	41	48	6,000
3. Telpher, horizontal benches, Linacre	2411	16	150·6	26	11	5,000
4. Telpher, vertical benches, Linacre	3342	20	167·1	41	27	13,000
5. Temperley transporter, Linacre	2132	15	142·1	38 (av.)	23	5,000
6. Temperley transporter, Wavertree	1309	12	109·1	24 (av.)	10	2,000
7. Hot-coke conveyor	2285	30	76·2	41	27	6,000

Note: In installations Nos. 1, 2, and 6, the coke is picked-up in skips at a point immediately outside the retort-house. In the other installations, it is carried all the way from the front of the retort-bench.

Table II.—*Powers and Efficiencies.*

—	Power Required at Maximum Capacity Average Continuous B.H.P.	Useful Work Done. H.P.	Efficiency.	Height Lifted.	Horizontal Distance Transported. (Average.)
			Per Cent.	Feet.	Feet.
1. Crane and gantry, Eccles Street	1·61	0·585	36·3	34	75
2. Crane and gantry, Athol Street	2·61	0·942	36·0	41	100
3. Telpher, horizontal benches, Linacre	4·79	0·509	10·6	26	300
4. Telpher, vertical benches, Linacre	4·93	0·966	19·5	41	250
5. Temperley transporter, Linacre	7·35	0·680	9·2	38	300
6. Temperley transporter, Wavertree	5·99	0·348	5·8	24	250
7. Hot-coke conveyor	14·95	1·461	9·8	41	300

Table III.—*Working Costs per Annum.*

—	Interest and Depreciation.	Maintenance and Renewals.	Attendance.	Power.	Total.	Per Ton of Coke.
	£	£	£	£	£	d.
1. Crane and gantry, Eccles Street	77	83	287	50	497	0·91
2. Crane and gantry, Athol Street	91	89	287	74	541	0·74
3. Telpher, horizontal benches, Linacre	241	270	287	140	938	1·61
4. Telpher, vertical benches, Linacre	334	281	287	144	1046	1·43
5. Temperley transporter, Linacre	213	205	287	215	921	1·68
6. Temperley transporter, Wavertree	131	145	287	175	738	1·70
7. Hot-coke conveyor	228	964	144	436	1772	1·62

therefore estimated, and based on the experience gained with the similar installation (No. 1) at Eccles Street.

The particulars given in respect to the hot-coke conveyor No. 7 have been based on information kindly given by West's Gas Improvement Company, Limited, of Manchester, from experience gained in many places where the West hot-coke conveyor has been used. In order that the comparison may be as fair as possible, the figures given in the tables are based on the assumption that each plant is worked under the most favourable conditions—that is, at its maximum working capacity. In the table of working costs (Table III.), the rate of interest and depreciation, the rate of wages of the attendant, the cost of power or of the coke fuel, and other matters have been taken as identically the same in each case, so that a fair comparison may be made.

Capital Cost.

The capital costs given in Table I. are actual, and include in each case the fixed structure or framework, the foundations, the travelling or moving portion, and the necessary skips to do the full amount of work. The electric motors for driving the plant are included in installations Nos. 3 to 7; but no amount is included for electric generating plant. The cranes, on the other hand, are provided with their own power-generating plant in the shape of steam boiler and engines. For the purpose of the comparison, the maximum possible working capacity in tons per hour has been taken throughout, in preference to the actual working capacity, as the latter is in many cases much below the full capacity, and it would be obviously unfair to base a comparison on figures which did not do justice to any particular machine.

Column 5, giving the stocking capacity per lineal foot of track, has been calculated from the actual maximum height of the stock heap (Column 4), assuming the coke would be unconfined by retaining walls, and would consequently rest at its natural angle of repose (45°).

In arriving at the total stocking capacity (Column 6), the whole length of the track outside the retort-house has been included, although actually the whole is not available. This has also been done in the interest of fairness.

It will be seen from the table that the steam-crane and gantry is the lowest in capital cost and in capital cost per ton per hour, and has the greatest stocking capacity per foot run of track. The hot-coke conveyor comes next to the crane and gantry in capital cost per ton; the Temperley transporter takes third place; and the telpher is fourth. In the case of the telpher, however, it has been assumed that only one machine has been working; the second one being held in reserve as a spare. If both machines were working at the same time, the working capacity would be doubled and the capital cost per ton halved. Even then the crane is lower in capital cost per ton of material dealt with, and has a very much greater stocking capacity per foot of track. The difference would be greater still if two cranes were included.

Mechanical Efficiencies.

In Table II. will be found the relative mechanical efficiencies of the four different systems of transport. The cost of the power required to drive a machine is an item which forms a considerable proportion of the total working cost; and mechanical efficiency therefore cannot be ignored. Other things being equal, the most efficient machine will be the most economical. For the operations of lifting, travelling, lowering, tipping, &c., the power required varies, and is always intermittent. In Table II., the power required at maximum capacity is therefore stated in average continuous brake horse power for the sake of greater simplicity and convenience of comparison. The figures under this head have been calculated from actual ammeter readings in the case of the electrically driven machines Nos. 3 to 6; while those relating to the cranes were determined from the steam pressure, area of cylinder, length of stroke, and revolutions per minute of the engines.

In regard to the hot-coke conveyor, the power required has been based on the information kindly supplied by West's Gas Improvement Company.

In the second column of Table II. will be found what is called, for want of a better expression, "useful work done," expressed in horse power. The term here used denotes the amount of power necessary to do the work, given ideal working conditions. The third column gives the ratio of the "useful work done" to the actual power expended, expressed in percentage; in other words the mechanical efficiency of the transporters. It will be seen that in this respect the steam-cranes come out in comparison very much superior to the telphers; while the latter are more efficient than the Temperley transporters and hot-coke conveyor.

Annual Working Costs.

The annual working costs given in Table III. are estimated on the assumption that each installation would be worked at its full capacity for 365 days in the year—an assumption which rarely, if ever, obtains in actual practice, but which places each of the systems on an equal footing for comparative purposes, for it is when fully worked at maximum load that the lowest cost of working is attained. Interest and depreciation have been taken in each instance at 10 per cent., made up of interest on capital 4 per cent., and depreciation 6 per cent., which would wipe-out the entire cost in about thirteen years.

The cost of maintenance and renewals for Installations 1 to 6, has been based on the actual amounts expended; a fair allowance being made for the difference between working at full load and at the load carried in actual practice. This item includes lubrication, repairs, renewals of working parts, ropes, track rails, &c., and painting the whole structure every two years. The comparatively low figure under this head for Installation No. 2 is due to the fact that no painting of the structure is needed, as the craneway is constructed in reinforced concrete.

All the installations with the exception of No. 7 are worked by one man; and the charge for attendance is the same throughout—*i.e.*, three shifts per day for 365 days. In Installations Nos. 1 to 6 it has been assumed that the skips are placed in position and hooked-on by the retort-house hands.

The figures under the heading of "Power," in the case of the electrically driven plant, are obtained by calculation from the brake-horse-power given in Table II., priced at 0·8d. per brake-horse-power-hour.

The fuel required for the cranes has been estimated from actual consumption, and charged at 9s. per ton.

The last two columns of the table, giving the total annual working cost and the cost per ton of coke handled, shows that the steam-crane occupies the first place, the telpher the second, the hot-coke conveyor the third, the Temperley transporter the last, although the latter runs the hot-coke conveyor very closely in this respect.

General Conclusions.

In every one of the comparisons given in the tables, it will be seen that the jib crane and gantry is superior to the other systems, and particularly in the cost of working—the factor which tells most in any comparison of this kind. The crane is not, however, suitable for every situation; and its limitations must be borne in mind. Its inability to operate skips conveniently right up to the retort-bench may in some cases be a serious handicap, as it involves the use of hand labour or some other means of moving the skip to a point outside the retort-house where the crane can deal with it.

Where vertical retorts are installed, and the coke is discharged underneath the bench, neither crane nor telpher can deal with it directly, and some means must be provided for moving the coke, at any rate clear of the bench. If skips are employed, very little extra labour would be required to move the skips a little further—*i.e.*, to the outside of the retort-house, where the crane could reach them. If a coke conveyor were used, it could be arranged to deliver into a skip outside the retort-house, which could then be dealt with by the crane. Where machine-stoked horizontals are installed, the coke may be discharged directly into skips on loose carriages, wheeled by hand labour to a sprinkling quencher, and thence to a point where the crane can pick them up.

The telpher has an undoubted advantage in being able to place the skip immediately alongside the bench; but it is a question whether the saving in labour thereby effected will compensate for the increased capital and working cost of the telpher as compared with the crane. In many installations, and especially of the vertical type, very little, if any, additional labour would be required to place the skip outside the retort-house.

In many cases, and more particularly where a long line of retorts is to be dealt with, it would, no doubt, be economical to instal a hot-coke conveyor for moving the coke horizontally to a skip immediately outside the retort-house; the skip being there dealt with by a crane and gantry.

Summary.

Of the four systems compared, the crane and gantry

(1) Is the most efficient mechanically.
(2) Is the lowest in first cost.
(3) Has the greatest stocking capacity per foot of track.
(4) Is the lowest in the cost of maintenance and renewals.
(5) Costs less in power than the other systems.
(6) Is the lowest in total working cost per annum and per ton of coke handled.
(7) Does not require so high a permanent structure.
(8) Is reliable, and requires only ordinary skill and attention.

DISCUSSION.

The President (Mr. J. G. Newbigging) said that Mr. Gibson had given them a most interesting and useful paper—one which bristled with contentious matter. He hoped they would reward the author by a good discussion. It was Mr. Gibson's first appearance at their meetings, and they were delighted to welcome him. He proposed to leave any remarks which he had to make on the paper until the end of the discussion.

Mr. J. H. Brearley (Longwood) said he must add his tribute to that of the President as to the value of the paper. As some of them might be aware, for some little time they had been carefully considering what type of carbonizing plant to adopt at Longwood, and also what method should be employed for moving the coke away from the plant. Possibly, he had not had a great deal of experience—except observation—of the mechanical transport of coke; but he had collated a considerable amount of information on the subject, and came to the conclusion, along with the author, that the system which Mr. Gibson had advocated—the crane and gantry—was the most economical one to adopt until he had put before him very forcibly the claims of the gravity-bucket conveyor. He happened to have experience of gravity-bucket conveyors some twenty years ago, for the conveyance of coal to a carbonizing plant, and he knew for certain the system had cost them very little during this long period. He would like

to ask the author whether, in dealing with hot-coke conveyors, he had considered the merits of the gravity-bucket conveyor for the removal of coke. He might say that, after examining the merits of it and going into the figures, he decided that the gravity-bucket conveyor was best for their particular needs—not only for putting the coal into the hoppers, but also for removing the coke away from underneath the retorts. He believed that there was much less wear and tear with the gravity-bucket conveyor than in any other system on which the author had based his figures; and there would also be an additional advantage—*i.e.*, the coke would not be broken up so much as would be the case with the system dealt with in the paper. He would have liked the author to have carried his comparisons [see summary] a little further than he had done in that respect. Mr. Gibson had confined himself to capital costs; but he had not said a great deal about the effect upon the coke. He would have liked him to have said a little more about the breakage of the coke—which system was the greatest and which was the least "sinner" in his experience. This question was quite an important matter for all of them, because it was not merely the capital cost, but how much it depreciated the property which they were handling.

Mr. H. KENDRICK (Stretford) said he desired to join with the President and the last speaker in congratulating Mr. Gibson on his excellent paper, in the course of which there was considerable food for thought. There were, however, one or two points with which he did not agree. So far as storing was concerned, the telpher machine did not do anything like the steam crane and gantry to which Mr. Gibson compared it. The author had made no allowance in working expenses for dealing with the skips. At Stretford they had two schemes—one a steam crane working on a gantry, together with a coke conveyor of a telpher type. Tenders were received for these two particular schemes, and they were as to costs very much in favour of the telpher. Whether they had any labour or not, there were certain expenses which would be additional to a telpher machine when they worked in the way Mr. Gibson suggested as being the most economical at Liverpool. This was the main line of his differences with the author. He would like to know whether Mr. Gibson had any figures which would give a fair comparison between the crane and gantry and the other style of transporters referred to in his paper.

Mr. T. DUXBURY (Oldham) said it was sometimes very difficult to make up one's mind as to what type of system to adopt. It was largely a question of local conditions being made adaptable to their particular needs, and therefore a matter for individual consideration. He was in agreement with the author on most of his points, particularly as to the steam-crane—perhaps because he had the steam jib crane system at Oldham. They had at Oldham, inside the retort-house, hot-coke conveyors, which, as Mr. Gibson said, lifted the coke outside to a receiving hopper. Here it was picked up by the crane and carried to the revolving screens or on to the heap. He could quite bear out the author when he said the cost of working these steam cranes was low. The cost of repairs was very low. When they had a small coke store it was advantageous to have a steam-crane as shown in the sketch given by Mr. Gibson. They found the steam-crane system very useful because it enabled them to spread over the yard at a great height. Personally he did not believe in great heights, because of the formation of breeze; but, he thought, with Mr. Gibson, that the steam crane was very beneficial in this respect. The method at Oldham was to take the coke from the retorts with a hot-coke conveyor. There was no doubt a very great deal of wear and tear on this type of plant, but at the same time they were useful machines for taking the hot coke outside the retort-house. His experience of the hot-coke conveyor working along with a steam crane for storing the coke showed that the crane system had some advantages over the telpher method. In one portion of his paper, the author said that "another objection which might be raised against the steam crane was that if the crane was out of action for the purpose of repairs or boiler inspection it would be necessary to revert to hand labour, or 'idle' the retorts." He took it this would be the case with any kind of plant unless it were duplicated, though at one of their stations they had worked with one crane for twenty-four years, and had no serious breakdown. At Hollinwood they installed a steam crane in 1905, and they had very rarely had a breakdown for more than an hour or two. It cost very little, and by extending the gantry a few yards at the skip-end they did not require to have a separate siding or crossing arrangement. They could work the two cranes; and if there was too much coke coming out of the retort-house, the two could be run just the same as they could run two telphers. In another part of the paper the author spoke about the three other systems being intermittent, and said that it was a feature worthy of note that the hot-coke conveyor was a continuous machine and always ready to receive the coke. It depended, however, pretty much on the local conditions of the works as to what kind of machinery should be adopted. Mention had been made as to the quantity of breeze caused by the handling of the coke. Some years ago he experimented with West's hot-coke conveyor. He screened the coke as it came out of the retort, and also at the end of the conveyor. After a number of tests, he was surprised at the small quantity of breeze. He also found that a large amount fell out before it was put on the conveyor. They did not take into consideration the amount of breeze which came out of the retort itself. Drawn from the retort and slaked with water, they had 11 per cent. of breeze that would pass through a ¼-inch screen; while at the outlet of the conveyor, and dropped on to a hopper, it was only 13 per cent. So there was only a difference of 2 per cent. made in the handling of the conveyor. It was quite evident therefore that with a hot-coke conveyor there was not so much breeze made as they sometimes expected. He found the coke conveyor did not drag the coke; it rode on the chain. He came to the conclusion that this was the reason they did not make so much breeze. He noticed that the author obtained his information from Messrs. West's as to the working of the hot-coke conveyors; and he thought that the firm had given a very reliable and close figure, which agreed with what they were getting at Oldham. He mentioned this because they did not always get such accurate figures from contractors—they generally gave the best obtainable. In Table III., he noticed Mr. Gibson put the maintenance and renewals at £964 per annum. This did not bear out anything like what they in reality got. Did it cost £964 on a capital expenditure of £2285 for maintenance and renewals? Their plant at Oldham cost about £2000; and he thought the repairs would not be more than £200 per annum. The paper would be of great assistance in the future to those who had transport plants to put in. At the present time he was in this position, and hardly knew which system to adopt. He was sure, however, that Mr. Gibson's paper would give him some insight and help him to decide what should be done.

Mr. J. C. BELTON (Chester) said he wished they had had the paper a little earlier, because it would have enabled one to formulate what one had to say on so important a subject. He congratulated Mr. Gibson, and was much indebted to him for the full way he had discussed his subject, as well as for the conclusions he had arrived at. The first paragraph clearly set out what the object of the paper was—viz., to discover what system of transport was the fittest. This question could only be answered according to individual circumstances; but taking the average gas-works, he thought that Mr. Gibson was perfectly justified in the conclusions he had arrived at—that the gantry and steam crane "took the cake." In the first part of the paper, the author said that "for some reason or other the steam jib crane and gantry had not generally been considered suitable for handling and stocking coke, and other means had been employed where the crane would have done the work more efficiently and economically." He was afraid that the reason the steam jib crane and gantry had not been more generally adopted was other than this. He was quite old enough to know better than to adopt anything just because it was simply up-to-date; and he thought a good number of their younger brethren might take this hint, if they would excuse him saying so. The crane and gantry had been passed by for some more modern form of coke conveyors without its claims being duly examined and weighed. From his own experience, he certainly confirmed Mr. Gibson's conclusions. Since 1902 he had been working with a crane and gantry at Chester. The circumstances, however, were perhaps different from other works to which allusion had been made. They had the retorts on the stage floor, 10 feet above the basement; and in front of the benches ran a line of rails to a turntable in the centre of the house. Skips were placed under each bed of retorts, and the coke slipped down the retorts into the skip partially sprayed. If the coke was not sufficiently quenched it received a further dose outside the retort-house door. It was then taken up by a crane and put through the rotary screening plant or on the coke heap as required. A great advantage of this system was that they were not always liable to a breakdown. Suppose they had a house fitted with coke conveyors running along the front of the bench. If this was on the stage floor of the house and for any reason it broke down, it necessitated the cessation of carbonization altogether, or an immense amount of inconvenience and expense in dealing with the coke from the stage floor. If the coke fell through shoots and on to the conveyor down below, they had the same inconvenience in a less degree. But with a crane—and if a crane broke down it did not matter very much—the only convenience needed was to put down a line of portable rails and let the men throw the coke up without any hindrance to carbonizing. This was one of the advantages shown by the adoption of the skip gantry and crane system. He was glad to find that the Liverpool figures compared very well with their own at Chester; but the author had not given them the cost of handling the skips in the house. In his own case, it amounted to 4·5ths of a penny. With regard to the table of costs, it must be borne in mind that the figures showed for 365 days. Of course, none of them had full work for any coke-handling plant all the year round. This figure must not be taken as the cost of working the plant year in and year out. As a matter of fact, it cost about 2d. and a fraction per ton of coal.

Mr. R. WATSON (Doncaster) said the excellent comparisons in the paper would help some of them to solve a difficulty if they were considering schemes for the mechanical transportation of coke. Some time ago they put down a coke conveyor at Doncaster, and the men about the place said to him, "Guv'nor, this is the best thing you have done for us." It certainly did take a lot of work off the men—work which they could hardly ask human beings to do in these days. He agreed with Mr. Duxbury when he said that too much had been made of the coke conveyor as a breeze producer. He had in his mind, as they were wanting additional storage room for coke, the advisability of putting down something in the way of a coke gantry and crane in order to take up a portion of the coke which came from the shoot to some other portion of the yard. He was inclined to think that a combination of the two systems would be an excellent one, because they cleared the retort-house of coke and were also storing it at any height

they desired. At the same time, the author had not added the cost of the outside conveyor to the coke-storing plant.

Mr. E. A. HARMAN (Huddersfield) desired merely to say how much he had appreciated Mr. Gibson's paper. He confessed that it had come to him as some surprise that Mr. Gibson's name was not upon the roll of their Institution. He thought this a "gross injustice" which could not be permitted to exist any longer (laughter). There was one point he would like to mention, and it was the question of depreciation. After considerable experience with hot-coke conveyors, he found that 6 per cent. depreciation was far too small a figure. He would strongly recommend any member to adopt a figure of (say) 10 per cent.

The PRESIDENT observed that Mr. Gibson had put them under an obligation for so readily and fully placing before them his experiences on this important question of coke handling. How to deal satisfactorily with the removal of hot coke from a retort-house and convey it to the storage yards, hoppers, or other parts of the works, had always been a problem with gas engineers. The difficulty had been accentuated since heavily-charged horizontal retorts had become common practice, and where a mass of from 10 to 15 cwt. of red-hot coke was discharged from the retort at one stroke. With continuously worked vertical retorts, where the coke issued from the retort in a comparatively cool state, and did not require quenching, the difficulty was not so pronounced. In this case, where the disposition of the retort-house to the other buildings allowed, there was no better method, in his opinion, than a system of telpherage. The telphers could be carried direct into the retort-house on one side of the bench, and the skips into which the coke was discharged removed with a minimum of labour from underneath the retorts to their position under the telpher track. The track could, of course, be constructed of any length outside the retort-house, and, in the case of large or moderate-size works, utilized for carrying the coke to a screen over which it was discharged into railway waggons, to the storage hoppers, carburetted water-gas plant, or boilers. In the case of horizontal retort-houses, he was not altogether satisfied that the carrying of the telpher track inside the retort-house—as the only means of coke conveying—was wise, because of the difficulty in quenching the coke. In most cases it was preferable to convey the coke from the retorts to the gable end of the house with a plate or drag conveyor, and then deal with it from this point with the telpherage system. The coke as it fell from the retorts into the conveyor and then gradually moved along the house, was more easily quenched than when falling in a more or less solid mass into the telpher skip. In large horizontal retort-houses it was money well spent to not only have a drag conveyor, but to carry the telpher into the house in addition, as a stand-by. The track, which simply consisted of joists attached to the roof principals, was inexpensive. The telpher could also be very usefully employed for lifting the retorts and fittings into position when resetting the bench. If anyone used Table III. in Mr. Gibson's paper when considering a system of dealing with his coke, he must not overlook the fact that the total working costs per ton of coke were based on the maximum working of the different plants, which in some of the cases would be difficult, if not impossible, of attainment. They were the natural exaggerations of the makers of the plant. In actual practice the coke dealt with could be at least one half, and in many cases less than half; so that the working costs would require to be multiplied by at least two. For this reason, in addition to giving costs of the maximum working of plants, he would have been glad if Mr. Gibson had given the costs in detail of removing coke from a particular retort-house carbonizing a definite quantity of coal per diem. Mr. Gibson seemed to have a sneaking regard for the steam jib crane or gantry method of dealing with coke, and there was no doubt that it was an economical method; but this system, as well as the Temperley transporter, was only of use outside a retort-house. They were limited to a great extent in their working as compared with the telpher plant.

Mr. KENDRICK said that before the author replied he would like to say a word. He understood Liverpool had been experimenting for some time past in coke quenching by means of steam. Could Mr. Gibson give them any opinion as to whether this was successful or not?

Mr. GIBSON prefaced his reply by stating that when he undertook this investigation he found it was a more difficult task than he at first anticipated. He had seen a good many statements that the telpher system was the most convenient way of handling a stock of coke. Most of the speakers, however, had supported his view that the crane and gantry was an excellent way of handling and stocking coke. Mr. Brearley had mentioned the gravity-bucket conveyor. It seemed to him, however, that this method was a very unsuitable one on account of the difficulty in filling the conveyor. The grit of the coke would cause an exceedingly great amount of wear and tear, and the wear of the buckets would be exceptionally heavy. If the conveyor were carried to a great height over the yard, the coke would have to drop from this height, and it would damage the coke—every particle of coke would have to descend from the high level to the ground. Mr. Brearley asked about the effect upon the coke of the four systems. Three of the systems dealt with coke in a skip; and with this method of handling they got the least possible amount of breakage. With the hot-coke conveyor it was different, because the chain running along the trough was bound to break the coke to some extent all round. Mr. Kendrick, who spoke of telphers, admitted that this system was not so good as the crane. He asked for the extra cost involved in carrying the coke out of the retort-house. This was rather outside the scope of the paper. Still, it was a point which he had to some extent looked into. He had prepared an installation in which the crane was at work and one with the telpher working; but they were not really comparable. It was so difficult to get the same size of plant to compare them. They could not form a true comparison unless they had the same carbonizing capacity in each case. Mr. Belton had, he thought, answered Mr. Kendrick to some extent. He thought Mr. Belton's figure was very low; but probably it would not be very much more than what he had indicated. Mr. Duxbury had, it seemed, agreed with nearly everything that was in the paper; but he raised a point in connection with the cost of the maintenance of the hot-coke conveyor, and one or two speakers had also referred to this subject. He could only say that his figure (£964) was obtained by taking an average. From Messrs. West's, and from other sources, he found it was a recognized figure to take 1½d. to 2d. per ton of coke handled as the cost of maintenance. He had taken an average between the two, and worked it out per ton of coke handled. The maximum capacity for 365 days in the year had been taken; and if they worked it out for themselves, it would be found that the tonnage of coke and the figure for maintenance was not far wrong. Mr. Watson had mentioned that the hot-coke conveyor might be used to serve the purpose of a coke-breaker. This was rather an ingenious idea. He (the speaker) observed that Mr. Watson also agreed that the crane and gantry system was the best under certain circumstances. Mr. Heald suggested that an electrical crane might be profitably used. The objection to this, however, was the cost of the power. He did not think they could have anything cheaper than the steam crane with its boiler fired by coke. With regard to the matter of quenching on conveyors, there seemed to be a difference of opinion as to the advantage of the hot-coke conveyor in this respect. It seemed to him that the hot-coke conveyor had an advantage, because the whole of the coke was within view as it travelled along the retort-house, and by means of a hose-pipe, which could be directed to any hot place, they could make sure that the coke was properly quenched. The period between the draws was certainly an advantage, because it gave time for anything which went wrong to be put right. Mr. Harman had mentioned 6 per cent. depreciation as being too small. This might be so, particularly in the case of the hot-coke conveyor; but the same figure had been taken throughout the tables for the purpose of comparison. With regard to the remarks of the President, he was glad that Mr. Newbigging pointed out that the working costs per annum were figures which could not be applied in regular practice, because they were based on a maximum capacity forthe full period of 365 days in the year—a thing which was impossible in practice. The President had referred to telpherage. There was no doubt that the telpher was a very suitable method of handling coke for vertical retorts; but for stacking purposes there was, he thought, no comparison between it and the crane. He still adhered to what he said in the paper—that by moving the skips just outside the retort-house, the crane system could deal with the skips in an infinitely better way than the telpher, and at lower cost and with greater stocking capacity. There should, however, be many cases in which the telpher would be more suitable. With regard to the gravity-bucket conveyor, the coke would have to drop from a great height, and would be damaged in the fall, apart from the damage done in the trough. He thanked the members for the kind attention they had given to the paper.

MAINTENANCE OF GAS APPARATUS.

By H. KENDRICK, of Stretford.

[A Paper read before the Manchester District Institution of Gas Engineers, Feb. 27.]

One of the periodicals devoted to our industry has advocated for some years past the sale of "light" at an inclusive charge per hour for a lamp guaranteed to give a minimum candle power; and as I survey the progress of gas lighting, we appear to have moved considerably in that direction during the past few years.

High-pressure gas for outdoor lighting needs no further introduction. Its success is so established, and its economy so pronounced, that its extension into the indoor lighting domain is only a matter of time. The charges for this are based entirely on giving a fixed minimum candle power at an inclusive price for gas, plant, labour, and maintenance. The fact, therefore, that we have been compelled to acknowledge the necessity of keeping the maintenance of a certain system of lighting in our own hands, ought to make us all the more alive to the necessity of obtaining control over all lighting, both high and low pressure, indoor as well as outdoor.

A great proportion of the complaints of poor supply, bad gas, or bad lights, which are being constantly brought before our notice are due to causes that can be remedied. But owing to the inherent conservatism of the average consumer, nothing is ever done until the light becomes so bad that nothing short of a hotly worded letter to the gas manager will relieve the exasperated feelings of the long-suffering consumer, or, what is worse, he consults

the local electrician, and is lost to us for ever as a consumer of gas.

There is not the slightest doubt, in the minds of most of us, that hundreds of consumers are lost annually to gas undertakings through bad fittings or burners that are merely out of order. The remedy is in our own hands. Local jealousies often interfere with the proposals of the gas manager for dealing with this state of affairs, especially in the interests of one small set of tradesmen, who have done as much to injure gas lighting and heating in the past by inability to locate the fault, and put it right, as have the "drifting" habits of the consumer himself. In a vast majority of our households the men do not interfere in any way with the domestic or lighting arrangements, mainly because they arrive home during a great part of the year after all the gas-consuming apparatus has been put to use; and it would be impossible to leave a room in darkness or cold while the burner or fire was overhauled. The work is, therefore, generally left to the ladies, or more often to the maids; and although some of the ladies are adepts in clearing away loose dust from burners and putting on new mantles, they cannot be expected to know all about a gas-burner, when it takes at least six months to train a man for the work before he can be left entirely to himself. The burners are therefore generally left to look after themselves, with disastrous results in the end for the credit of the gas undertaking.

The necessity therefore for periodical inspection of all gas apparatus is imperative if we are to retain our consumers and extend our operations. The main difficulties to be contended with in the area of every gas undertaking will be found to be: Inefficient or unsuitable appliances; appliances out of order or out of adjustment; and untrained workmen.

The latter we have at last made a start to remedy; and the establishment of classes in "Gas-Fitting" at the technical schools throughout the country should in a year or two give us a body of workmen more capable of intelligently dealing with gas appliances than they have been in the past. But valuable time has been lost, and much ground has been gained by our friends the electricians, and we must impress upon our committees and boards the urgent necessity of providing means for the training of every man in the employ of gas-fitters, plumbers, and those in the gas-fittings and maintenance departments of gas-works themselves. The training must not end with the technical schools, or with the workman with whom the young fitter has to work, but—as shown by Mr. Goodenough in his Institution paper of 1913—each apprentice, and each maintenance man, must have special instruction from the chief of his department on the special precautions that must be observed, due to the peculiarities of his own particular make of gas, pressures in the districts, and amount of aëration necessary for complete combustion.

It must not be overlooked either that inspectors are sometimes as ignorant of the details of the business as are the workmen; and their knowledge and fitness must be looked to. We have found in several cases that the best men for the position of chief inspectors are not those who have had a plumber's or gas-fitter's training, but who have approached the work with an unbiased mind and evinced an interest in their departments. Such men make by far the best inspectors, and will repay the instruction and trouble taken with them.

I am well aware that the red-herring, "expense," will be drawn across the trail. I do not suggest, however, that gas undertakings should all immediately set up fitting and maintenance departments on a scale sufficiently large to do *all* the business within the limits of their area of supply, but to adopt first one branch and then the other, as occasion offers, and let it develop gradually. Or if there is a balance at the end of the year's working—if it is a small one—seek to appropriate it for the benefit of the consumers, do something more for them than you have done previously, enable them to get full value for their money by keeping their burners in such condition that they are obtaining the maximum amount of light from the gas they consume, or their fires, cookers, &c., so that they give out their maximum duty in heat units. You may not be able to show the results in actual cash on the balance-sheet, but the general results will improve; and a consumer satisfied that he is obtaining value for his money in one direction is far more likely to become a consumer for other purposes than lighting than is a dissatisfied consumer.

The practice in some undertakings which have undertaken this work is to commence with a small staff on the public lamps, and overhaul consumers' burners and apparatus on their sending the usual complaints. In many cases the work has been commenced by instituting a scheme by which the consumer paid an inclusive sum for overhauling burners monthly and supplying any mantles required. These schemes have frequently been changed for a small charge for cleaning only; the materials used being paid for separately. My Company found that the latter was most satisfactory for the consumer, but the former more profitable for the Company. Finally, it was decided, after careful consideration, to do all the work free of cost, and charge for the materials.

Although it would no doubt have been better in the interests of the consumers as well as the undertaking to have made special efforts to induce all consumers to place their burners in our charge, questions of finance had to be considered; and it was decided to circularize the consumers and afterwards allow the work to grow gradually, so as not to affect unduly the revenue account at the first. There was also another difficulty. There was no body of trained men that we could put on the work; and the corps of inspectors had to be educated. Since the first circular was sent out, the work has advertised itself and grown gradually—not so fast as we would like, but as fast as we could cope with it.

The following table gives the number of consumers and costs for the past seven years.

	Premises.	Burners.	Annual Cost.	Cost per Burner per Annum.
1908	265	2,380	£180	18·15d.
1909	294	2,738	225	19·72
1910	303	2,931	216	17·69
1911	329	3,176	236	17·83
1912	794	7,536	320	10·19
1913	1690	16,399	546	7·98
1914	2195	20,250	624	7·39

In the earlier years the inspectors paid visits to houses monthly but we found that this was unnecessary, and now only visit each premises six times per annum—four times between the middle of September and the middle of April, and twice in the remaining five months. This has been satisfactory to our consumers and has very much reduced the cost. The average number of burners and glass we expect a man to attend to per day must not be less than 50, or 280 per week. This they have done without difficulty, and it has proved satisfactory so far. Each man has his own district; and in addition two men are set apart for special work and complaints. We have adopted a card system for all our work, which greatly facilitates supervision and reduces office expenses to a minimum. The inspectors' stock of mantles, &c., is checked and balanced with the cards and ticket books every week. A considerable trade is done in mantles, burners, and glass, by the inspectors, all being charged for at retail prices. The profit on these, however, is not (for booking purposes) debited to the maintenance work; but it is considerable, and more than covers supervision and office expenses in all the branches. We have not the slightest doubt that we have retained many consumers who would otherwise have gone over to electricity, and prevented hundreds of complaints of bad gas every year.

The work is advertising itself, and our men are frequently called in to houses where they have never been before by consumers as they pass along the street, or asked by one consumer to call on a neighbour. Our object is for the work to grow slowly, as it is difficult to obtain men and have to train them ourselves. Their training is done on the works, where they first attend to our own burners under the supervision of one of the older men, and are given demonstrations of the correct size of flames, length of rods and mantles, and the effect of aëration on luminosity. The construction of burners and lamps is explained to them, and all repairs are carried out by them under supervision. After three to four months of this training, they are sent out on the district to assist another inspector for two or three months. They are then given a district themselves; the Chief Inspector watching them closely for a few weeks. By this time they are fairly expert, and are only watched when it is known there will be burners that are difficult to adjust properly. In addition to this work, they take out and fix all orders for new burners and glass from the showrooms, and generally undertake any small repairs and leakages from fittings.

What has been said about the necessity of keeping burners in order applies with equal force to cookers, grillers, fires, and all other apparatus. But as these are usually the property of the gas undertaking, there is all the more reason that they should be kept in working order, to prevent them being returned to the stores by disgusted consumers, and to ensure them being used and returning an adequate profit to the undertaking. Money spent in periodical examinations of these is money saved. It means less money spent in changing apparatus, and faults are found and remedied before they become acute. The complaints, too, that are now made at the offices are on the average much less serious than formerly; and in a vast number of cases are merely reporting defects that the consumer knows will be immediately put right.

We have just completed five years of the work and have employed two inspectors. A third man will be started later in the year. They inspect the fires twice, and the cookers and grillers once a year, and clean burners, replace fuel and worn-out parts. The effect on the general complaints can best be shown by the following statements:—

	Inspectors.	Complaint Men.	Apparatus Installed.				
			Meters.	Cookers.	Grillers.	Gas-Fires.	Other Apparatus.
1909	*Nil*	3	11,485	1,399	4,751	703	42
1910	1	3	11,905	1,472	5,358	742	53
1911	1	3	12,482	1,513	5,927	772	66
1912	2	3	12,709	1,657	6,314	1,214	73
1913	2	3	13,015	1,912	6,609	1,778	85
1914	2	3	13,203	2,118	6,728	2,194	111

In addition to the above, there are over 900 cookers privately owned, which we also inspect and keep in order free of charge—merely sending in an account for the material used. So that, although the total number of appliances inspected has increased 32½ per cent., the wages paid have increased less than 20 per cent. [see table of costs, p. 517].

In my Presidential Address in 1910, I gave the result of a preliminary examination of some of the cookers and fires then in use,

which proved that this work should be undertaken regularly if the consumers were to be ensured good results; and I reproduce some of the figures, as they are instructive.

	Gas-Fires.	Cookers, &c.
Apparatus inspected	442	133
Found in good order	72	56
,, defective	370	77

The principal defects found were:

Gas-Fires.

Out of adjustment	24
Dirty burners and defective fuel	348
Defective nipples, firebricks, and flues	36

Cookers.

Defective cocks, &c.	42
,, and choked burners	52
,, grillers	36

The cost has been as follows:—

	Wages Inspection.	Wages Complaints.	Total Wages and Materials Repairs.
1909	*Nil*	£195	£895
1910	£66	198	878
1911	81	202	999
1912	131	207	975
1913	134	204	1,018
1914	128	210	936

The costs given under the head of complaints include meter changing as well as repairs to cookers, fires, grillers, &c., as the same staff of men attend to all complaints. It will be observed that, although the number of gas appliances has increased greatly, the cost of the repairs, &c., has not increased in proportion, and for 1914 even shows a decrease.

In preparing cookers that have been previously in use for sending out again, the aim should be to make them as presentable and as efficient as possible. We always examine the packings, and if necessary renew them. We generally find it is desirable to add new packing, as with constant use, and the shaking incidental to carriage, the silicate cotton is often found missing at the top of the cookers, and when ready to go out again they are, as a rule, better packed than when received from the makers. They are also relacquered and all bright parts polished. If the linings are badly burned or chipped, they are renewed; and all grill strips and tin goods are replaced with new or retinned articles. The gates and interior fittings are lacquered and stoved, and the cooker when complete is tested with all burners lighted, to prove that it is in working order, and free from objectionable smell from the lacquer, before being sent out.

Many little economies can be practised in preparing cookers and tinned goods. The interior fittings are dipped in the lacquer (not painted), air-dried, and stoved. A large number can be prepared by a boy in a very short time. Another source of economy is in the provision of tinned goods. All managers are aware of the difficulty in persuading consumers to use old tins, however clean they may be, and the difficulty of disposing of old tins when scrapped. We have adopted "retinning" as a means of meeting these troubles, and our expenditure for the past three years in new tinned goods is instructive.

1912	£50 3 0
1913	62 1 5
1914	16 0 9

We installed in the autumn of 1913 an electro-tinning plant by Canning and Co. at a total cost of about £68, including dynamo, depositing, drying, and cleaning vats, polishing wheels, and the necessary shafting, gas, steam, and water supplies. The total cost will be repaid in less than two years. The only annual charges are for the renewals of the chemicals, tin anodes, steam, water, and gas, which will not cost more than £10 per annum—the costs for 1914 being between £4 and £5. The power for driving is obtained from an existing engine; and the labour actually costs little or nothing, as the work is done by the shop foreman with the assistance of a boy. If all the time actually worked on the process is charged, together with the materials, the cost of retinning the cooker and griller tins only amounts to £27 for the year, or slightly more than half the cost of new tins.

The cost of inspection and repairs to gas-fires has been:

	No. of Fires.	Inspection Wages.	Total Rerairs, Wages and Material.	Cost per Fire.
1909	703	*Nil*	*Nil*	—
1910	742	£33	£33	—
1911	772	40	40	—
1912	1214	66	75	14 8d.
1913	1778	67	109	14·7
1914	2194	61	158	17·3

The figures for the last three years include the cost of renewing fuel, &c., on hired fires, and, as one would expect, are highest during 1914 owing to the absence of renewals the previous years. The cost for last year can be taken as the normal, as it includes re-enamelling, and renewal of fire-brick backs, of a considerable number of fires that have been returned. On the 1914 figures, the cost of repairs is only 3·6 per cent. on the expenditure, including fixing.

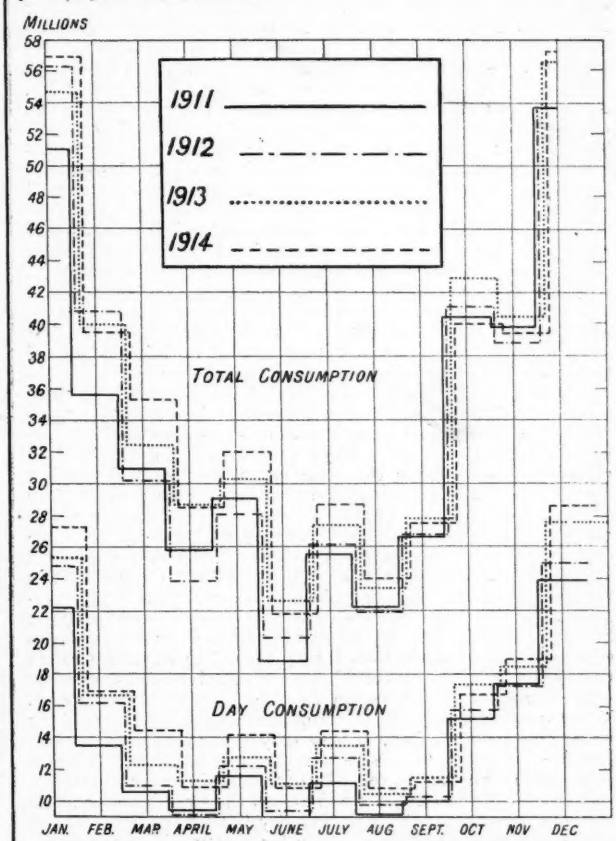
In fixing our hiring rates, we estimated on 12 per cent. for renewals; so that there is a very considerable margin for replacements of cast-iron parts and flues. The probable result of our experience, on a revision of rates, will be a reduction of the charges.

In order to make the fires that have been returned equal to new, they are all re-enamelled and stoved, and the fire-bricks washed with fire cement before being sent out.

The costs of maintaining high-pressure gas-lamps I cannot give definitely, as we have only been working eighteen months in one district, and our figures are inconclusive. I can positively state, however, that the 1914 figures show a balance on the right side, and a fair sum towards the probable cost of replacement of the lamps. Our charges are slightly lower than our neighbours, and our expenses probably higher, as the installations are small; the shopping areas being at three different centres, each separated by 1½ to 2 miles of fields and residential property.

There remains very little for me to say now except that we believe in the old adage, "A thing worth doing is worth doing well;" and we have endeavoured to imbue all the members of our staff with the same spirit. That this is being done is proved from the fact that large numbers of our consumers regularly come to us with their troubles and difficulties in the sure and certain knowledge that we shall do our best for them, and at the same time for ourselves as well. We endeavour to make our consumers contented; if we fail, we trust it is not through remissness on our part. Our aim is to supply gas of good and constant quality at sufficient and constant pressure, and follow it up with full and efficient service, by keeping all gas-consuming apparatus in as perfect condition as possible. Our reward has been a constantly increasing day load, which now approaches 50 per cent. all the year round. If we have not succeeded in satisfying all our customers we have tried to do so, and only failed in some cases because there are still a few people in the world who never will be satisfied whatever is done for them.

In order to show what the effect of pushing gas apparatus for heating purposes, together with the maintenance of same, has been upon the gas sent out by my Company, I have had prepared a small chart illustrating the monthly delivery of gas over the four years, 1911 to 1914 inclusive.



STRETFORD GAS COMPANY.—GAS SENT OUT 1911 TO 1914.

The months of January and December should be ignored, as these figures are not reliable, owing to the overlapping of the lighting and heating load, as all the gas sent out between 6 a.m. and 6 p.m. is reckoned throughout the year as daylight consumption. There is also another disturbing factor that enters into this question—viz., that our largest consumer (under a change of management) has reduced the consumption of town's gas very considerably during the past fifteen months. He has insisted on their own Mond gas being used to a very much greater extent, and has introduced economies in other directions. The result has been that there is a reduction in the gas delivered to this particular firm of over 9 million cubic feet in the twelve months; and in addition to this during the months of August, September, October, and November, 1914, in our manufacturing area there was a further reduction of 3 million cubic feet. This is all daylight gas.

The diagram shows the gas sent out in millions of cubic feet—

not in percentages; so the increases shown are actual quantities. It will be noticed that in 1914 the effect of the war is distinctly shown both in the total consumption and in the daylight consumption; but the daylight consumption shows a lessened reduction than does the total. Also that, though generally each year is an advance on the previous one, the increase in consumptions between 1911 and 1914 is much more marked in the daylight consumption than in the total; and although the total consumption is higher, three-fourths of the increase is due to day consumption —this despite the loss of 12 million cubic feet on the manufacturing side in 1914.

I think the diagram proves that the hiring and maintenance of gas apparatus has paid my Company, irrespective of the rentals that have been charged for the appliances themselves.

DISCUSSION.

The PRESIDENT (Mr. J. G. Newbigging) said that, with the permission of the members, he would like to invite Mr. Councillor Kay, the Chairman of the Manchester Corporation Gas Department, to open the discussion on the paper. He was sure Mr. Kay would give them some interesting facts. At the same time he would like to take this opportunity of expressing his personal thanks to him for attending the meeting. Mr. Kay had not only honoured him, but also the Institution. Their thanks were due to him for taking so keen an interest in their deliberations. His work was not only confined to Manchester, but to various parts of the country. He had great pleasure in asking him to make a few remarks on Mr. Kendrick's paper.

Mr. KAY, who was received with great applause, desired to thank Mr. Kendrick for his most interesting paper, and also to thank the President and his colleagues for the kind way they had mentioned his name, as well as for the hearty welcome they had given him. He could not criticize the paper very much, but he would venture to add a little to it. As most of them knew, he was very greatly interested in the Manchester gas undertaking; but he never forgot the fact that he was for seven years Deputy-Chairman of the Electricity Committee of the Corporation. He was also a member of the Gas Committee at the time; so that he saw both sides of the question. He was bound to say that Mr. Kendrick had only outlined what most of them would have to take in hand sooner or later if they wished to hold their day-load. The calorific standard was the thing of to-day, and the illuminating value was becoming a thing of the past. Unless they could get and keep a good day-load in the summer—which could only be done by adopting some of the measures which Mr. Kendrick had indicated—they must look forward to losing the bulk of their lighting load. It was a regrettable fact that the average plumber had an entire disregard of, and no interest whatever in, the proper adjustment of gas-fires or the modern incandescent light. Especially was it to be regretted that a municipality having plumbers as ratepayers displayed such ignorance of the first axioms of their business, and that instead of helping forward the business of the municipality, they did all they possibly could to interfere with it. A further point they ought to consider—they could not criticize it—in the paper was the taking up of the question of the maintenance of gas-fires. This factor had undoubtedly led to the popularity of gas-fires at the present day. In Manchester they tried some years ago fixing gas-fires, and they left them to the tender mercies of the plumber. Some 1200 gas-fires were sent out, and they became a nuisance to the owners and a bugbear to the Gas Committee. They were, however, all pulled out, and when they attempted the system again they adopted a scheme of maintenance and supervision, with the result that in two years they had 15,000 gas-fires in use, and not a single complaint. This all went to show that Mr. Kendrick was on the right lines, and he (Mr. Kay) agreed that it was up-against them as gas engineers and managers that, if they desired to be successful in this particular line, they should make it their business to do more for the consumer in the future than they had done in the past. There would certainly be no fear of the competition of electricity in their particular sphere if they only lent themselves to their business properly. Of this he was perfectly satisfied. It was a most remarkable fact in regard to the Manchester undertaking, that, in spite of the war, they had exactly the same increase in the total consumption on the preceding day (Friday) as they had the corresponding day last year. As in Mr. Kendrick's case, this consumption was wholly a day-load increase, which was evidenced by the number of cookers going out day by day, and the thousands of fires which were being fixed in shops, offices, &c. At the present time they were sending out about 400 cookers and 200 fires every week. The gas-fire season was now nearly over, but the cooker trade was coming along. The fact that they showed this increase in spite of the war was a tribute to the excellent working of the undertaking over which Mr. Newbigging presided—at the practical end of it. They had recently instituted a very necessary reorganization of this department, and had given Mr. Newbigging practically the whole control from the manufacture of the gas to the consumer's meter. This re-arrangement had tended to the better management and control of the department, and from his (Mr. Kay's) point of view it simplified his position very much indeed, and things worked very happily and very comfortably. With regard to the question of maintenance—he said this to give Mr. Kendrick an opening for a reply—he could only say that his figures were very moderate; but he was satisfied that he had done the right thing. He was very pleased that Manchester had a neighbour in the Stretford Gas Company—a neighbour who set an excellent example to themselves. After referring to the hearty way in which he was supported by his Committee, Mr. Kay went on to say that they hoped to adopt a scheme on the lines which Mr. Kendrick had laid down in his paper. He was much obliged to the members for the opportunity they had afforded him of hearing the paper read. Mr. Kendrick had made some allusion to the lighting of schools. It was a terrible thing for him (Mr. Kay) to say that the Manchester Education Committee were until a few months ago actually using the old batswing burner. They had had some little trouble in persuading them to change for more modern methods; but he was glad to say that they had now installed new incandescent burners and accepted a scheme to maintain them. Not only was this an augury of good for the future, but it made a great improvement in the lighting of the schools. The reading of the paper had been of great interest and benefit to him; and he thanked them very much.

Mr. E. H. HUDSON (Normanton) said he was sure they had listened both to Mr. Kendrick and to Mr. Kay with a great amount of pleasure. It was very gratifying to know that, even in a place like Manchester, which was generally in the advance guard of progress, they were willing to take a lead from their neighbours at Stretford; and if they took it up as fully as Mr. Kendrick had done, they would certainly profit by extending the facilities they were at present offering to their consumers. The main point brought out in Mr. Kendrick's paper—which, by the way, was not a paper they could criticize—was the confidence created between the gas committee (or company as the case might be) and the consumer. At Normanton he had experienced just the same results as Mr. Kendrick. People, for instance, would not nowadays go to the plumbers for gas apparatus. If he referred them to plumbers (say when they were shorthanded at the gas-works), they refused to go, but were content to wait until they were able to render the service they required. Mr. Kendrick, however, had adopted the system of letting the apparatus out on hire. He (Mr. Hudson) had been a convert for many years to the principle of supplying gas apparatus free. He thought this question required the consideration of gas engineers and gas committees as to whether this was not the proper course to adopt. They had at Normanton laid out a lot of capital on gas apparatus, and were quite prepared to spend money to get gas laid into houses. When they got inside a house and had the lighting load, then it was profitable to give a differential rate, and supply the gas apparatus free of charge. Many engineers had recommended, and some had adopted, differential rates for different purposes, and varying discounts for two different kinds of apparatus in the same house. He thought that, instead of having two sets of pipes and two meters with varying prices for gas, it would be better to charge the gas at a uniform rate. He, perhaps, could claim to be the pioneer of free gas-fires, and he thought if he was in a residential district he would not be satisfied until he had a gas-fire burning in every house. As it was, however, he had a large number in use at Normanton. The maintenance of, and thorough attention to, gas-fires was absolutely necessary. At Normanton they had a periodical inspection not only of fires and cookers, but of ring-burners; the result was that they got a greater consumption of gas and avoided all the complaints which were the bugbear of every gas engineer.

Mr. W. WHATMOUGH (Heywood) said he quite agreed with Mr. Hudson that Mr. Kendrick's paper was scarcely one they could criticize. Personally, he had been very much interested in all that he had told them, and congratulated the author upon the success of his schemes. At Heywood they started a system of maintenance in 1903; but in 1912, following the example of Mr. Kendrick, they decided to do the work free of charge. When they made a charge they had 1624 burners in use, and the cost per burner was 3¼d. In 1914, when they did the work free, they had 2850 burners in use. So that in two years' time they had an increase of 709; and the cost per burner worked out at 5·8d. Mr. Kendrick's price worked out at a little over 7d. The question of gas-fires they took up about five years ago. They had a simple rate—from 6d. to 1s. 6d.—for the winter quarters only. They had 280 fires out, and found them a very good investment indeed. He did not think, however, that they would be able to follow Mr. Hudson's lines yet; but there was no doubt that the lines advocated by Mr. Kendrick were the right ones on which to increase gas consumption.

Mr. W. B. M'LUSKY (Halifax) complimented Mr. Kendrick on his interesting paper. He (the speaker) had had some interesting experiences with regard to the maintenance and also the fixing of gas fires and cookers. He thought in some parts of Yorkshire the gas-fire business had been destroyed to a large extent by improper fixing and adjusting, and it would take some time to get over the prejudice which existed in the minds of consumers. They had, however, many thousands of gas appliances out, and although some of the things fixed were very small, he did not object to this, as if they got an article which the consumer would use they ought to be satisfied. For instance, he did not think it was necessary in every instance to fix a cooker with a slot meter. In many cases, it was quite adequate, and met the needs of the case, if they fixed a boiling burner or a griller. They had pursued this policy with a great deal of success in Halifax, and had also been able to meet consumers' requirements by fixing hot-plates without ovens. They did this in order to supply the local demand for hot-plates alone, and had been very successful. With regard to gas-fires, he found that it was absolutely necessary to attend to the fuel and the cleaning and adjustment of burners. They

did it in Halifax twice a year. With regard to burner maintenance, he had been of the opinion for many years that it would pay a gas department to spend 1d. per 1000 cubic feet of gas to subsidize the maintenance business. The consumer wasted 20 per cent. of the gas he bought. Therefore the 1d. would be very well spent indeed. The larger consumers could, of course, very well afford to pay 1s. per burner per annum; and this was a very moderate charge. They had not yet adopted any scheme for the maintenance of burners at Halifax, because the business they had done in cookers and fires had aroused some feeling among the master gas-fitters of the town. The Gas Department had, however, been willing to meet the fitters on as reasonable terms as was possible. At the beginning of their recent enterprise they offered the fitters 15 per cent. on the selling cost of all articles bought in the show-room, and a contribution of 5s. towards the expenses of fixing. In some cases these terms had been accepted, and the fitters were helping them. Others, however, held the opinion that the Gas Department would be fulfilling their duty to the public by keeping open the show-room as plumbers' agents and plumbers' merchants. This, of course, was something that the Corporation could never entertain for a moment. So long as the gas-stove business was allowed to be carried on in an indiscriminate way, the hardware merchants took very little notice of it; but when the Corporation made it a success, they cried out that the Corporation were taking away their living! In Halifax they adopted the good old Scottish fashion of asking people questions; so that when the hardware men asked them questions they asked another, and they were at present in the position that the hardware men had not answered them. He believed that it was in the interest of every gas department to cultivate a working arrangement with the trade, as it was certainly sound policy to work hand in hand with them. They must, of course, always conserve the interests of their consumers. He had lately formed the conviction that they ought to do something more for consumers than to simply fix gas apparatus. The gas which was sold to the working man for a cooker or a gas-fire should be sold at less than the ordinary rate. This class of consumer was entitled to special consideration. The policy had paid well at Huddersfield; and the large increase in consumers was proof of the wisdom of it. People who had removed from Huddersfield to Halifax had told him that the conditions there were very much more favourable; and they did not grudge the amounts paid for gas, as they believed they were getting very good value. The spending power of such people, so far as gas consumption was concerned, was limited; and if they could show them how to economize, the consumer would be grateful—and, incidentally, an advertisement for the department. His idea was to adopt a modification of the Brighton system. He would take the consumer's normal requirements for lighting, and would charge all gas consumed in excess of this at another rate. He ventured to place his views before the meeting as something to think about; for he felt that it only wanted a little courage to put it into operation. After an allusion to the necessity of persuading consumers to use gas washing boilers,

The PRESIDENT said he did not like to draw the discussion to a conclusion, but he was afraid he would have to do so. Mr. Kendrick had certainly made out a good case for the system of periodical inspection of gas apparatus. It was quite true that, unless they had this system, they could not give any permanent satisfaction to their customers or to themselves. As to plumbers, they should not have anything to do either with the fixing of gas apparatus or of meters. Mr. M'Lusky, however, rather favoured the idea of working along with them. There was, however, the great difference in the charges for fixing. If some arrangement could be come to, well and good; but to put this extra charge to consumers on the price of the gas was entirely wrong—they must conduct the business on a business basis. If there was any complaint they had to make against Mr. Kendrick, it was that he had given them a paper which they could not criticize, but one with which they were agreed in every particular. With regard to the gas-fitting classes which Mr. Kendrick had had a good deal to do with, the first examination for gas-fitters was being held that day in Salford coincidentally with Mr. Kendrick's paper.

Mr. KENDRICK said the discussion had taken the direction which he hoped it would—it had not been a discussion on his paper at all. He was not at all surprised that so many of them had branched-off the subject which he had tried to bring before them. So far as the dealings of his own Company with plumbers were concerned, they had for many years past endeavoured to come to an understanding with them. Mr. Kay had referred to the question of lighting Manchester schools. At Stretford they were looking after the schools in their particular area, together with churches, clubs, and many other institutions. The maintenance department had grown from a very small beginning, and was an important branch of the work they carried on. They were, in fact, compelled to extend it, owing to the success it met with from its foundation. They heartily congratulated their President on the fact that his sphere of influence had been extended. Mr. M'Lusky had said he would be prepared to go to 1d. per 1000 cubic feet for maintenance of burners. Up to the present, the cost to the Stretford Gas Company had been one-third of a penny, and they had practically only touched the fringe of the work. He felt honoured that Stretford had been referred to in such kindly terms by Mr. Councillor Kay, and would be more so if anything he had put before them that day induced them to follow a small place like Stretford.

YORKSHIRE JUNIOR GAS ASSOCIATION.

At the Leeds University, on Saturday afternoon, Mr. JOHN W. LEE, Chief Chemist to the Grassmoor Company, of Chesterfield, delivered his Presidential Address to the members of the Yorkshire Junior Gas Association. Mr. J. B. BALMFORTH, of Silsden, occupied the chair during the delivery of the address, which was as follows:

PRESIDENTIAL ADDRESS.

Gentlemen,—I am conscious of the honour you conferred upon me when you elected me as your President. For this honour I desire to thank you. During the past few weeks, however, I have been much more conscious of the main duty of the presidentship—the preparation of an address. Every year makes this duty a more arduous one. The multiplicity of kindred societies, the lack of really new matter, and the few opportunities for original work add to the difficulties of the task. The special stress which the last few months has placed upon all of us has brought to your President new duties and long hours of labour, leaving few opportunities to do justice to the task which he has to fulfil to-day. I ask for your patient forbearance, therefore, while I present to you some gleanings gained in performing the "daily round, the common task."

I shall, perforce, address you from the standpoint of the chemist. It is fitting that this point of view shall have a prominent place in our "Transactions." Our allied industries of gas manufacture and coking practice can only be kept on a sound footing by the equal recognition and co-operation between the engineer, the chemist, and the commercial man. Each department has its proper functions to perform; and our Gas Associations are doing splendid service in giving opportunities for the consideration and discussion of these several branches of our great industry.

OTTO COKE-OVENS.

The battery of bye-product coke-ovens upon which I have gleaned for my address consists of 110 Otto ovens. Sixty of these are of the waste-heat type, and fifty regenerative ovens. Of the waste-heat ovens 50 are 33 ft. 7 in. long by 6 ft. 10 in. high, and 1 ft. 9 in. wide. The other ten waste-heat ovens are 33 ft. 7 in. long by 7 ft. 2 in. high by 1 ft. 9 in. wide. The 50 regenerative ovens are 33 ft. 7 in. long by 6 ft. 10 in. high by 1 ft. 9 in. wide. The heating of the waste-heat ovens is done by means of 15 vertical flues, and the regenerative ovens by 18 vertical flues. The general arrangement of the ovens will be readily understood by means of the slides and drawings; and these will serve to refresh the memory of those members who were of the party visiting the Otto experimental plant at Crigglestone recently.

The weight of stamped wet coal charged per oven will average 8·25 and 9·1 tons in the waste-heat oven and 9·7 tons in the regenerative; and the charge will be burnt off in 34 hours and 36 hours respectively. The total capacity of the ovens is about 550 tons of coal per day.

The coal used for coking consists of mixtures of the holing slacks obtained from the Tupton, Dunston (Heathcote), Deep Hard, and Blackshale seams. Average analyses of these, before washing, show:

	Tupton.	Dunston.	Deep Hard.	Blackshale.
Moisture per cent.	5·52	8·08	5·61	3·93
On dry basis—				
Ash	11·33	16·12	20·70	8·80
Volatile matter	28·84	28·66	26·88	31·64
Fixed carbon	59·83	55·22	52·42	59·66
Chlorides equal to NaCl	0·112	0·023	0·049	·086

The slacks are washed in a Humboldt washer, and after washing the average of daily analyses over a long period give

Moisture	11·31
On dry basis—	
Ash	6·08
Volatile matter	34·06
Fixed carbon	59·86
	100·00
Chlorides equal to NaCl	0·056

To check the working of the washer, it is necessary to estimate the coal going away in the dirt. A representative sample of the dirt over twenty-four hours should be retained and dried. Weigh 50 grammes of dry coal. A special separator with a wide tap is half filled with chloroform and the coal swept into it. Stir well with a glass rod and allow to settle. Run off dirt from bottom tap and filter chloroform back into separator. Allow to settle, and run off again. Repeat until all dirt has been washed out. Run off chloroform and coal through a filter, and dry and weigh the coal. The whole operation takes but a few minutes, and is far in advance of the old method of using a saturated solution of calcium chloride. Average daily tests show 3·5 per cent. of coal in the dirt. The coal is charged into the ovens, after stamping, by means of a Buchanan machine, and can also be charged from the top in case of a breakdown of the charging machinery.

COKE.

The coke is discharged from the oven by an electrically driven ram, travelling on wheels (which also carry the stamper box) into

a "Goodall" coke quencher. The quencher is driven by a motor. The coke is quenched by passing a "Darby" quenching hood, and finally on the revolving table. After draining, the table is reversed, and the coke passed, by means of a conveyor, over a screen into the railway waggons direct. The "Goodall" quencher is an excellent machine; and by its use the moisture content of the coke can be easily controlled, and the breeze and dust kept down to a low figure.

Using a coal mixture of the following composition:

	Per Cent.
Moisture	12·99
Ash	5·65
Volatile matter	30·53
Fixed carbon	50·83

the coke yield was made up of:

	Per Cent.
Large coke	95·2
Small coke	2·0
Dust—below ½ inch	2·8

giving on analysis:

	Large Coke.	Small Coke.	Dust.
Moisture	1·80	16·97	21·55
Ash	9 45	10·33	12·47
Volatile matter (on dry)	0 69	3·27	5·56

The ovens have an ascension pipe of 11 inches diameter.

TAR.

The volatile products pass up the ascension pipe into the hydraulic main, which follows the usual coke-oven practice, and is of the "dry" type. The temperature of this main varies from about 110° to 150° C. By circulating tar through the main very little trouble is experienced with pitching-up. Some solid deposit has collected of the following compositions:

	Per Cent.
Ammonium chloride	48·0
Tar (ether and benzol extract)	30 8
Coal dust and free carbon	21·2

The tar, after circulation, had a specific gravity of 1166, and gave on distillation:

	Per Cent. By Volume.	Per Cent. By Weight.
Ammoniacal liquor	3·1	1·8
Light oils, up to 170° C.	2·3	1·9
Middle oils, 170° to 270° C.	21·6	31·4
Heavy oils, above 270° C.	10·3	10·6
Pitch	—	53 6
		99·3

Free carbon content, 13·4 per cent.

The collected tar from all points had a specific gravity of 1164, and gave on distillation:

	Per Cent. By Volume.	Per Cent. By Weight.
Ammoniacal liquor	2·1	1·8
Light oils up to 170° C.	2·3	1·9
Middle oils, 170° to 270° C.	29·4	26·5
Heavy oils, above 270° C.	17·8	16·6
Pitch	—	52·6
		99·4

Free carbon content, 11·2 per cent.

Leaving the hydraulic main, the gas enters the "Serpentine"—a series of pipes, 24 inches in diameter and 1350 feet in length, set horizontally, which serve as air condensers. The gas leaves here at a temperature of about 65° C., and, being divided into two streams, enters a battery of three water coolers, rectangular in section, 5 ft. 4 in. by 7 ft. by 19 ft. high. Leaving the coolers at a temperature of about 18° C., the gas passes through liquor sprays. The sprays were put in to assist the ammonia scrubbers in the removal of ammonia. They have not proved of much use for this purpose, but certainly serve as excellent tar-extractors, and therefore indirectly help the scrubbers. After the sprays the two streams of gas join, and pass through two tower scrubbers 8 ft. 3 in. in diameter and 23 feet high.

A series of tests showing the strength of the ammoniacal liquor collected at each point may be of interest:

	Free NH_3. Per Cent.	Fixed NH_3. Per Cent.	Total NH_3. Per Cent.
Hydraulic main	0·102	7·093	7·195
1st coolers	0·382	0·083	0·465
2nd ,,	1·454	0·051	1·505
3rd ,,	4·675	0·085	4·760
Before sprays	1·295	0·051	1·346
After ,,	1·303	0·051	1·354
No. 1 scrubber	0·741	0·034	0·775
No. 2 ,,	0·398	0·017	0·415

At the outlet of the ammonia scrubbers, the gas is divided up into two streams again; and each stream passes through two benzol scrubbers, each 8 ft. 3 in. diameter and 56 feet high, filled with wooden grids. In order to prevent corrosion in the tubes of the benzol stills, it is essential that the gas entering the benzol scrubbers should contain the minimum amount of ammonia. One gramme in 100 cubic feet should be attained in good working. My plan is to keep a twenty-four hour test running at the outlet of the benzol scrubbers; and our average over twelve months is 0·07 gramme per 100 cubic feet (equal to 0·06 lb. of ammonium sulphate per ton of coal (10,000 cubic feet).

Creosote oil is constantly circulated over the grids in the benzol scrubbers, and absorbs the benzol from the gas. From these scrubbers the gas passes to the ovens, boilers, or purifiers.

I will now briefly deal with the working-up of the ammoniacal liquor, the extraction of the benzol products, and the utilization of the gas—dealing in more detail with the second point, as requested by a number of our members.

AMMONIACAL LIQUOR.

The liquor is converted into sulphate of ammonia in a plant of the well-known Wilton make, and calls for no special description. Two stills, each capable of dealing with 80 tons, and one still of 150 tons per twenty-four hours, two saturators, each of sufficient capacity to produce about 10 tons per diem, and a centrifugal dryer, comprise the plant. Excellent sulphate is produced, of a good colour, averaging:

	Per Cent.
Sulphate of ammonia	96·90
Chloride ,,	·03
Free acid	·48
Moisture	2·50
Insoluble matter	·04
	99·95

The waste liquor [six tests per day for a year] average:

	Per Cent.
Free NH_3	0·0056
Fixed ,,	0 0014
	0·0070

The "Devil" liquor averages:

	Per Cent.
Free NH_3	0 0228
Fixed ,,	0·0062
	0·0290

About 0·9 ton of sulphuric acid, and 2·5 cwt. of lime are used per ton of sulphate produced.

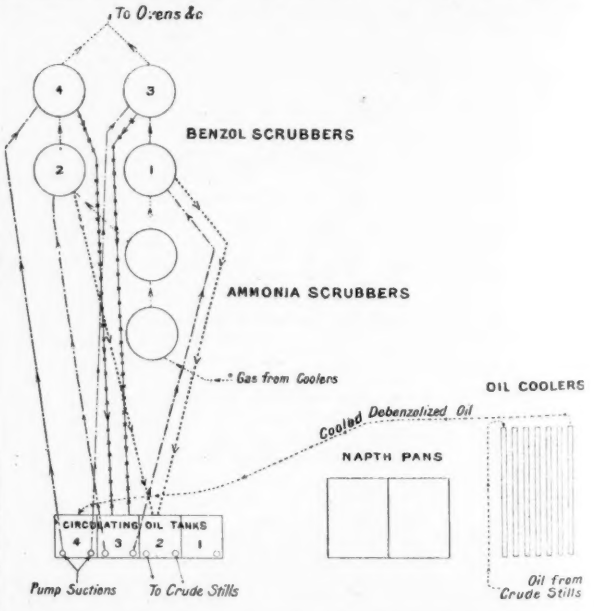
Except during a period when the acid supplied contained a large quantity of arsenic, no difficulty has been experienced in producing a salt of good colour. The acid should be as free as possible from iron content. A typical acid gave:

143° Twaddel.	Per Cent.
Sulphuric acid, by titration	80·640
Iron equal to Fe_2O_3	0·059

The gases from the saturator, after cooling, pass into the main supplying gas to the ovens, and are there burnt; the chimney gas averaging 1·4 grammes of SO_3 per 100 cubic feet.

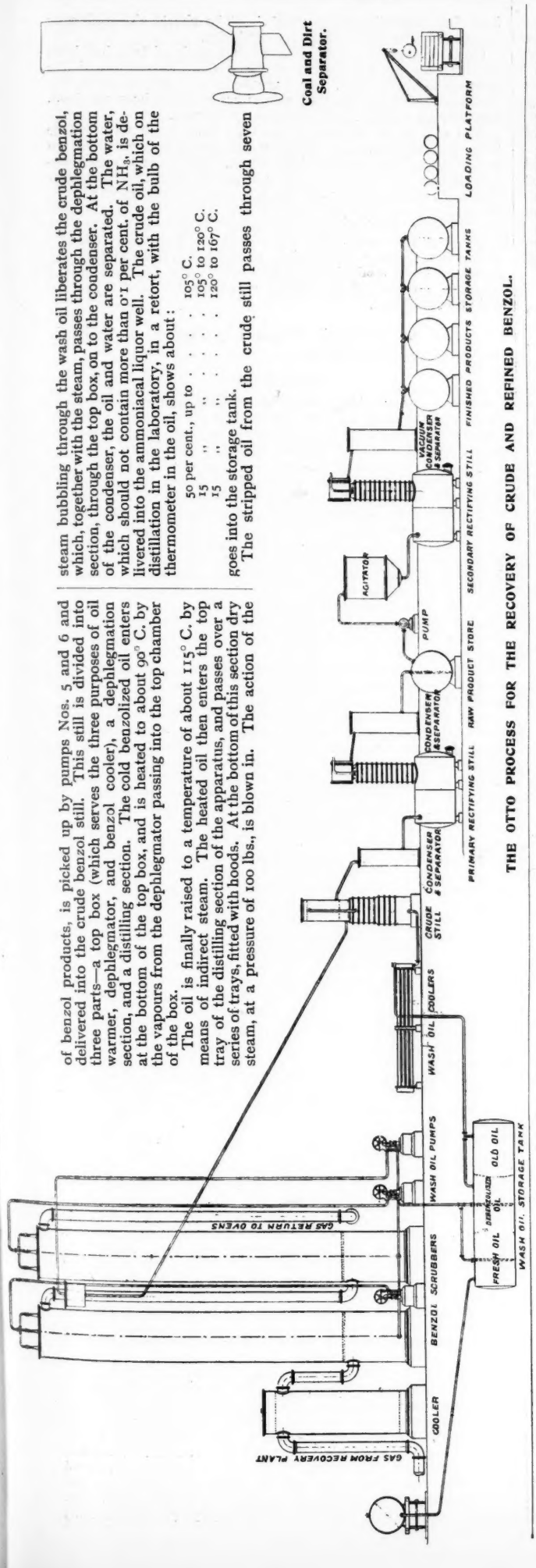
BENZOL PRODUCTS.

The method of extracting the benzol from the gas is illustrated. A circulating tank divided into four compartments contains the wash oil. No. 1 contains fresh oil and is filled by gravitation from the railway tanks on the siding adjoining. The wash oil used is coal tar, creosote, and should approximate to the following specification: Specific gravity 1000, distilling not more than 5 per cent. up to 200° C. (bulb in vapour), not less than 90 per cent. up to 300° C. (bulb in vapour), and contain not more than 5 per cent. naphthalene and 1 per cent. water.



No. 2 benzolized oil, No. 3 partly benzolized oil, and No. 4 debenzolized oil. A battery of seven pumps, running at forty revolutions per minute off one shaft is connected to these tanks. By an arrangement of three-way cocks the suction of each pump may be put on any compartment in the circulating oil tank, and the delivery set into compartments Nos. 1, 2, or 3. The oil is pumped from No. 4 compartment on to Nos. 3 and 4 scrubbers, and runs by gravitation back through the scrubbers into No. 3 compartment, is picked up again by Nos. 3 and 4 pumps, and delivered on to scrubbers Nos. 1 and 2, running back into No. 2 compartment. The benzolized oil, containing about 5 per cent.

THE OTTO PROCESS FOR THE RECOVERY OF CRUDE AND REFINED BENZOL.



of benzol products, is picked up by pumps Nos. 5 and 6 and delivered into the crude benzol still. This still is divided into three parts—a top box (which serves the three purposes of oil warmer, dephlegmator, and benzol cooler), a dephlegmation section, and a distilling section. The cold benzolized oil enters at the bottom of the top box, and is heated to about 90° C. by the vapours from the dephlegmator passing into the top chamber of the box.

The oil is finally raised to a temperature of about 115° C. by means of indirect steam. The heated oil then enters the top tray of the distilling section of the apparatus, and passes over a series of trays, fitted with hoods. At the bottom of this section dry steam, at a pressure of 100 lbs., is blown in. The action of the steam bubbling through the wash oil liberates the crude benzol, which, together with the steam, passes through the dephlegmation section, through the top box, on to the condenser. At the bottom of the condenser, the oil and water are separated. The water, which should not contain more than 0·1 per cent. of NH_3, is delivered into the ammoniacal liquor well. The crude oil, which on distillation in the laboratory, in a retort, with the bulb of the thermometer in the oil, shows about:

50 per cent., up to	105° C.
15 ,, ,,	105° to 120° C.
15 ,, ,,	120° to 167° C.

goes into the storage tank.

The stripped oil from the crude still passes through seven coolers, each 23 ft. 6 in. long and 9 inches in diameter, with four limbs in each, of the Lucas design, constructed strictly on the counter-current principle. Leaving the coolers at a temperature of about 18° C., it returns to circulation through tank No. 4.

The crude benzol is now distilled at about 200 gallons per hour in the first rectifying still by means of indirect steam at a pressure of not less than 100 lbs. to the square inch. This still has a capacity of 6000 gallons, with a tray dephlegmating column, supplemented with a top box through which water can be passed. During distillation the products are separated into crude 90 per cent. benzol, crude 90 per cent. toluol, and crude 90 per cent. solvent naphtha. The residue in the still, consisting of light creosote saturated with naphthalene, is run into cooling pans. After cooling the creosote is drained off from the naphthalene and returned to circulation through tank No. 4. A typical distillation gave:

6382	gallons	into still
3863	,,	90 per cent. crude benzol
601	,,	,, ,, ,, ,, toluol
409	,,	,, ,, ,, solvent naphtha
1256	,,	oil returned to circulation

The oil returned to circulation had a specific gravity of 1·015, and on distillation with the thermometer bulb in the vapour showed:

First drop	166° C.
Up to 200° C.	14 per cent.
200° to 270° C.	86 ,, ,,

The crude products are separately washed in an acid-proof agitator, partially homogen lead lined, of the Lucas design. The working capacity of the washer is 4000 gallons. The products are first washed with strong sulphuric acid, 168° Twaddel (92 per cent. by titration), to extract all resinous substances dissolved in the crude products. After washing for an hour, the acid residue is run off from the bottom of the washer into acid pots, and the "treacle" boiled up with direct steam. The carbon is solidified, and the acid, of about 32° Twaddel, containing 18 to 20 per cent. of sulphuric acid, is used in the sulphate of ammonia plant. After draining off the acid, the contents of the washer are agitated with caustic soda solution of 40° Twaddel for an hour. After standing, the residual solution of soda, &c., is drained off, and the washed product passed into a second rectifying still, similar in capacity and construction to the first, and is distilled by means of indirect steam. Washed solvent naphtha is distilled with indirect and direct steam under vacuum.

After washing and distillation, the products obtained are:

Pure 90 per cent. benzol
Pure 90 per cent. toluol
Pure 90 per cent. solvent naphtha

Each portion, after being condensed, passes into its respective storage tank, and is ready for shipment.

Over a year's working, for each ton of acid used 7544 gallons of products have been washed, and for each ton of "Kausticine" (90° Twaddel 43·4 per cent. NaHO) 34,214 gallons.

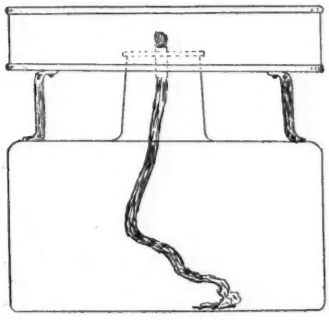
The loss in washing is 5, 6, and 25 per cent. in benzol, toluol, and solvent naphtha respectively. The relative qualities of the washed products recovered have been 74 per cent. benzol, 10·8 per cent. toluol, 15·2 per cent. solvent naphtha, and the average quantity 2·5 gallons per ton of dry coal.

In use the wash oil thickens, and its efficiency decreases. It is then taken out of circulation, and returned to the distiller. The spent oil has a specific gravity of 1090, and gives on distillation:

Up to 200° C.	11·6
200° to 300° C.	69·4
Residue	19·0

There is used 0·096 gallon of fresh creosote per gallon of washed product recovered, and the loss of creosote is 0·044 gallon.

The plant is controlled entirely from the laboratory; but I should only weary you did I attempt to outline all the tests made. I will refer only to two. First, the estimation of the benzol left in the gas. Here is an opportunity for a junior to make a name by linking it to a test for small quantities of benzol in gas, which shall be quick and accurate. The most practical one is to pass a



Lamp for Sulphur in Benzol.

measured quantity of gas through a cylinder containing specially prepared creosote, and keep the cylinder and its contents at a low temperature. The benzol is absorbed, and can be estimated by careful distillation. I tried estimating the benzol as nitrobenzol by shaking up a sample of gas in a 10,000 c.c. separator,

with a mixture of fuming sulphuric acid and nitric acid. The method is too slow and tedious for a works laboratory, and the results too unreliable. An instrument called a "Gravitometer," and depending upon the difference in gravity between "stripped" and "unstripped" gas, has been designed by Messrs. Alexander Wright and Co. It is claimed that this instrument will give a constant record of the efficiency of the benzol-recovery plant. If the claim can be substantiated, it will prove a most useful apparatus on a bye-product recovery plant.

For estimating the sulphur content of benzol, I used the stand and spirit lamp in conjunction with the Referees' sulphur test apparatus. There are mixed and burnt in the lamp to dryness, 3 c.c. of benzol and 50 c.c. of alcohol (on which a blank test has been made). A further 15 c.c. of alcohol are added, and the condensed products dealt with as an ordinary sulphur test. The weight of $BaSO_4$ in grammes × by 3211 = grains of sulphur per gallon.

GAS.

Of the gas produced, from 75 to 90 per cent. is required to heat the ovens of the waste-heat type, and 50 to 60 per cent. those of the regenerative type. The rest is used for lighting, heating, in gas-engines, and for burning under boilers.

Under the first three heads about 700,000 cubic feet per day are used. As the gas at the outlet of the benzol scrubbers contains over 900 grains of sulphuretted hydrogen per 100 cubic feet, it is purified by oxide of iron in four purifiers of the Milbourne type, each 20 feet square by 5 feet deep. The boxes hold about 30 tons of oxide in two tiers, on ordinary grids. Two classes of oxide—"Lux" and bog—are in use. Laboratory tests of these gave:

	Lux.	Bog Oxide.
Moisture as received	48·26	43·86
On dry basis—		
Organic matter and combined water	8·81	32·06
Iron equal to Fe_2O_3	73·59	56·94
Calcium equal to CaO	1·69	1·23
Insoluble matter	9·39	8·68
Mgo. alkalies, &c. (by difference)	6·52	·69
H_2S absorbed—		
On dry basis—		
First fouling	20·6	21·5
Second ,,	19·8	17 4
Third ,,	26·5	14·1
Fourth ,,	20·9	12·3

Working the purifiers on the old system, and without air addition, in practical use the bog oxide picked up sulphur, as follows:

	Moisture.	Sulphur. On Wet.	Sulphur. On Dry.
First time out	37·83	6·61	10·63
Second ,, ,,	27·67	15·74	21·76
Third ,, ,,	10·47	36·94	41·26
Fourth ,, ,,	2·73	47·52	48·85
Fifth ,, ,,	3·58	48·64	50·46
Sixth ,, ,,	3·99	55·68	57·99

Working the backward rotation system, and adding 2 to 2·5 per cent. of air, the following result was obtained:

	Moisture.	Sulphur. On Wet.	Sulphur. On Dry.
First time out	24·33	22·70	30·00
Second ,, ,,	13 00	45·92	52·78
Third ,, ,,	6 96	60·00	64·49

The amount of gas passed per charge increasing from 9 million cubic feet to 65 millions. The average composition of the purified gas is:

CO_2	3·6
C_nH_m	2·6
O	·3
CO	7·6
H	50·2
CH_4	30·1
N	5·6

The unpurified gas contains cyanogen equal to 1¼ lbs. of $Na_4Fe(Cn)_6$ 10 H_2O per 10,000 cubic feet. The sulphur content was 25·48 grains per 100 cubic feet, and the calorific value 550 B.Th.U. gross (500 net). The bulk of the gas is used in three engines of the Westinghouse vertical tandem type, each having four cranks and eight cylinders, of the dimensions 15½ in. and 16½ in. by 16 in. stroke. The full load of each engine is 500 B.H.P. at 300 revolutions per minute. The engines are coupled to 350 kw. Westinghouse alternators, generating three-phase current at 440 volts and 50 cycles; direct coupled exciters being provided. The total load on the connections is about 1280 H.P., and consists of fans, haulages, rams, quenchers, creepers, conveyors, picking belts, workshops, machinery, &c. The engines, at a load factor of 59 per cent., use 46 cubic feet of gas per unit of electricity. The cost per unit, including charges for management, running, repairs, purification (not gas), is 0·12d.

Experience has proved that a daily test of the exhaust gases for carbon dioxide, oxygen, and carbon monoxide results in an economical gas consumption. Average of good working results show:

	Per Cent.
Carbon dioxide	9 8
Oxygen	2·2
Carbon monoxide	*Nil*

The steam required for the whole coke-oven plant is generated in three Babcock and Wilcox boilers by means of the waste gases from the waste-heat battery. The temperature of the waste-heat flue approximates to 1000° C. The charts obtained on a thread recorder demonstrate its regularity.

On the colliery a saving of many thousands of tons has been obtained by an installation of three CO_2 Recorders of the Simmance-Abady type. An increase in CO_2 percentage in the chimney gases from less than 5 to 10 per cent. has been obtained, representing a theoretical saving of 17 per cent.

As I said in my opening remarks, I have given only jottings from my daily routine; but in conclusion may I plead for an enthusiastic regard for this daily round. Much that seems unimportant should be done with scrupulous accuracy, and the results obtained recorded and carefully tabulated. The day of records on handy pieces of paper has gone by. The work which should be done under the heading of "routine" is sufficient to tax the energies of the most enthusiastic worker. The works chemist should not, however, be merely a machine, but from him should come ideas and methods by which the full value shall be obtained from the raw product upon which our country's financial position will ultimately rest.

[The address was amply illustrated by diagrams on the blackboard and by lantern slides.]

DISCUSSION.

The CHAIRMAN said the members had listened to a very useful description of daily work in bye-product coke practice; and he hoped they would avail themselves of the opportunity of asking questions or discussing the points of this interesting subject.

Professor COBB, of the Leeds University, wished first of all to welcome the Association to the Department of the University which was so closely associated with the industry [the Department of Coal Gas and Fuel Industries]. He was particularly glad that associated with this meeting was to be another item of business which would also be one of great pleasure; he referred to the coming presentation to Mr. William Cranfield, as a mark of the desire of the members to testify their respect and esteem for him and his long connection with the Association. With regard to the President's address, in approaching the question of a complicated plant of the kind dealt with, most of them must have the same impression as he had had—viz., that it had been already very carefully worked out in every detail, and that the control of it had been also extremely carefully carried on by many competent managers, chemists, and engineers. In one sense this thought was apt to induce in the young man entering upon the duties connected with plant of this kind something of a feeling of discouragement. He (Professor Cobb) would like to say, from his own personal experience, that such a feeling was altogether unjustified. There was no plant which had been worked out to greater perfection, and opportunities would always occur for the man who really applied himself diligently to the work which might come before him. After all, if they attempted a critical analysis—he did not mean a fault-finding analysis—they saw at once that perfection had not been attained. Looking at the process simply as a fuel-using one, they had to draw up a mental balance-sheet. They had something going into and something coming out of the plant, and they had to decide whether or not what came out was the maximum of what one might be entitled to expect if the conditions were favourable. Plant of this kind was run in connection with large coal supplies; and in the very beginning a problem awaited a perfectly satisfactory solution, inasmuch as the usual process naturally produced a certain amount of material which, though it was a very low-grade fuel, was *in toto* of very high value; and the methods of utilizing fuel of this kind—such as belt picking, &c.—called for working-out, ingenuity, and engineering skill. The problem was not simple, because, though low-grade fuel had in it a large number of thermal units available, it cost just as much handling as high-grade fuel, and cost far more in labour. So that, if they were considering utilizing, through gas-producers, the low-grade fuel, they were left with the high labour charges necessary for dealing with the large percentage of ash which unfortunately came in at the bottom of the producer. The item which seemed most promising to pay for these labour charges was the nitrogen which the coal remaining in the low-grade fuel still contained. The recovery of this nitrogen as ammonia could be made the item in the mental balance-sheet which was required. Still the process was not yet, in any sense, a completely worked-out one; and therein lay an opportunity for the young men in the industry. Then, again, when the coke had gone through the oven, the fraction of it, large, of course, in total, which was found to be below a certain size—the dust and the breeze of the plant—had not anything like the same market value as the larger coke. When they began to deal with the composition of fine dust, whether in the state of coal or coke, the difficulties of management were very considerable. Suppose they took the case of using it in a gas-producer, they had to face the fact that any rapid current of air, which they would naturally use if they wanted a large output, was sufficient in itself to cause a great liability to a falling-off of a large proportion of unused gas. On account of the way in which fine dust would lay in a producer, there was a tendency to form a seal comparable with the sand seal with which they were all familiar. In this connection, a considerable portion of the nitrogen was still available in the coke dust; and so there was quite a promising field for the recovery of a reasonable amount of ammonia from the dust when the mechanical difficulties had been overcome. This opened up a problem which had never been properly appreciated. The action of steam upon coke in liberating

ammonia was by no means independent of the previous treatment which the coke had undergone. He might indicate quite a number of problems of this kind; but he would only refer to one which was more obvious than many. In recovering ammonia, the ordinary way in which to make it marketable was to convert it into sulphate; and the sulphuric acid used for the purpose had to be brought from outside. Still, if one looked at the analysis of the coal, it was found that there was more than enough sulphur in the coal to provide this sulphuric acid, if only satisfactory means were adopted for conveying the ammonia into it. This problem, which had, so far, defied to a great extent a satisfactory solution, was merely the finding of some way of adding the few necessary atoms of oxygen which would convert the ammonium sulphide into sulphate. A very large quantity of high-grade gas was used in the process of heating the ovens, whereas there were no real difficulties in the way of heating such ovens with a low-grade producer gas. This aspect of the subject had been, to a considerable extent, worked out, and was probably likely to be operated to a very much greater degree, liberating large quantities of high-grade gas for its proper use.

Thanks to the President.

Mr. Charles Roper (Bradford), in moving a vote of thanks to the President, said he was, personally, glad Mr. Lees had based his address on the lines of daily work. It was a point on which he (Mr. Roper) had worked last year when he was in the same position as Mr. Lee. He had been satisfied himself, and evidently it had been worth while, because Mr. Lee had chosen a similar course. He (the speaker) only wished he had heard the address a long time previously, and then he would have been better equipped for some of his visits to various coke-ovens as representative of the Association. There was little doubt that those who were accustomed to laboratory work were more at home on this question than others who only by chance came occasionally in contact with the chemical side of the industry.

Mr. A. Edwards (Leeds), in seconding the motion, said the subject was one which touched them all very closely, particularly now that, owing to the war and the Explosives Committee, they were having to devote considerable attention to the recovery of toluol from their gas. They had now to instal for the manufacture of explosives the very gas-washing process about which they had heard.

The motion having been carried unanimously,

The President, in a brief response, said there were many problems for all of them to solve in connection with the process. Their day had not gone by; there was plenty of opportunity open to them. The question of the manufacture of sulphuric acid was a very important one now. He had worked out the requirement, and found that the gas contained sufficient sulphuretted hydrogen to supply, when converted into sulphuric acid, all the requirements of sulphate of ammonia on the plant, and leave an excess of upwards of 100 tons of pure sulphuric acid per month.

Presentation to Mr. Cranfield.

The presentation was then made to Mr. Cranfield. The proceedings attending it are noticed on p. 500.

The Next Meeting.

The Hon. Secretary (Mr. E. Garsed, of Kippax) announced that the next meeting of the members would be held on the 20th inst., and would take the form of a visit to the Cleckheaton Gas-Works.

The "Engineers' Year Book" has been now placed before the public for the twenty-second time. Despite the war, the usual custom of bringing up to date the matter contained in it has been followed, and each subject has been revised by the expert who has charge of it. There are thirty-five sections, which shows how each branch of engineering has become specialized. The section on "Gas" is in the hands of Mr. Henry O'Connor; and there are articles on "Acetylene," by Professor Vivian B. Lewes, F.I.C., F.C.S., and on "Petrol Air Gas," by Mr. Scott Snell. The idea of publishing such a work annually is an excellent one, as usually text-books get woefully out of date. The book is under the editorship-in-chief of Mr. H. R. Kempe, formerly the Electrician to the British Post Office, and principal Staff Engineer of the Engineer-in-Chief's office at the General Post Office, London.

Action of Tin on Water.—In an article on "The Action of Lead, Copper, Tin, Nickel, Zinc, and Aluminium on Water," by Dr. W. P. Jorissen, of the University of Leiden, in the "Chemical News," he remarks that though tin will dissolve in the presence of air, as the hydrogen may be oxidized on the surface of the metal, its catalytic action in this respect is smaller than that of lead. It is therefore to be expected that tin will be proof against the action of pure water; also that, unless impure, it will either not dissolve at all, or only in small quantities, in water containing carbonic acid, when air is absent or nearly so. That technically pure tin, of the kind used as lining in water-pipes, is acted upon by drinking water has been found by C. P. E. Ribbius and W. D. Gratama. Heer J. D. van der Plaats observed in such cases across the tin greyish stains and streaks consisting of stannous and stannic oxide, mixed with substances deposited from the water; but no definite conclusion was arrived at regarding the question whether or not galvanic action had played a part.

PETROL SUBSTITUTES.

As already announced in the "Journal," Professor Vivian B. Lewes is delivering three Fothergill Lectures at the Royal Society of Arts, upon Motor Fuels. Two of the lectures have already been given. The first, on Feb. 15, was mainly taken up with statistics of imports of petrol into this country, and a general consideration of the properties of petrol for the particular purpose in view. In the second lecture, on Feb. 22, however, Professor Lewes devoted himself almost entirely to a consideration of substitutes for petrol as a motor fuel, and dealt first with benzol.

The need for substitutes was dependent not so much on the fact that the natural oil supplies of the world are likely to give out in 300 or 150 years' time, or whatever period various authorities might put forward, as that within a very short time—say, 50 years—the natural supplies would be diminished to such an extent that the depth from which the oil will have to be obtained will render them practically commercially unavailable. As demonstrating the fact that the supply of petrol is not much more than keeping pace with the demand, it was mentioned that the total world's output of crude oil, which in 1914 amounted to 57 million tons, has only increased at an annual rate of 6 per cent. for the past three years. The amount of petrol obtainable from the crude oil could only be put at an average of 10 per cent. Thus the output in 1914 was only 5·7 million tons of petrol, equivalent to 1700 million gallons. Of this quantity, America used no less than 1200 million gallons, and England, in 1914, imported 120 million gallons; making a total of 1320 million gallons, and leaving only 390 million gallons of petrol to-day for the whole of the remainder of the world. This obviously was a very strong reason why substitutes should be investigated.

Attention was first directed to benzol—the product of the distillation of practically all carbonaceous material. Benzol had a most interesting history. It was first discovered by Faraday, who was investigating the liquid hydrocarbons produced from oil gas, which was in use long before coal gas and which had, as one of its great attractions, its portability. Faraday, at the Royal Institution, showed that in these liquid hydrocarbons one of the chief substances, if not the chief substance, was the hydrocarbon which had the formula C_6H_6. Later on, in 1845, Hoffmann, working at the old School of Chemistry, discovered that this substance was present in coal tar. Practically no use at all, however, was made of this discovery; and it only became commercially interesting when Perkin discovered coal-tar dyes. It was in this way that benzol at once centred upon itself the attention of manufacturers of anything which would give benzol.

Up to that time benzol was almost a waste product. Prices were hardly quoted, and it could be obtained at 4d. or 5d. per gallon in large quantities. But when the demand came, the price rose until, when the aniline dye industry eventually started, benzol was fetching 15s. per gallon. The aniline dye trade, however, was then taken over practially entirely by Germany, who devoted an enormous amount of scientific care to it; and in the large aniline factories over there, laboratories have been put up without regard to expense. One firm employed 200 research chemists simply to thresh out the whole subject and get hold of all the ins and outs of the tremendous complex reactions which hedged the whole of the subject around. It was in that way, by casting their bread upon the waters and carefully collecting the products which eventually came back, that the German manufacturer had made himself master of the aniline dye trade, and had practically killed it in England. This was the keynote of the whole thing; and if we in England were to capture the aniline dye trade we must do the same—we must put good scientific work into it. We must not take the ordinary commercial man's view of the thing, that he would not give a chemist £150 a year to do experiments unless he could see that he could make that £150 a year out of it. This was not the spirit which would ever put anything further forward. We must work on the broader lines and get to the bottom of the truth of the thing, which alone would give us the true mastery over it.

Another direction in which the Germans had shown us the lead in connection with benzol was with coke-ovens. As soon as they got hold of the uses to which benzol could be put in the dyeing industry, they commenced to put up recovery plants in Westphalia and Silesia; and they produced benzol in such enormous quantities that they hardly needed to come to England for it. It took us 25 years before we followed in their footsteps; but at last the recovery oven came here. At first the steel maker was against it, because it gave him a dull coke, instead of the pretty silvery article from the beehive oven, and he would have nothing to do with it. It did not matter that it was demonstrated to him that it was cheaper, and gave just as good results—he did not get the silvery appearance he had been used to, and at first he would not touch it. Subsequently, however, he quickly overcame his prejudice, and recovery plants had in many cases ousted the beehive oven. Yet, even now, one-half of the coal carbonized by the steel makers was dealt with in the beehive oven, in spite of the activity during the last two years to obtain benzol for motor purposes. This, however, was partly due to many forms of coal swelling enormously when carbonized, and were thus not fit for heating in the ordinary recovery plant. This was one of the main

reasons why the recovery plants had not entirely superseded the beehive oven.

So far as recovery plants had been installed, the Germans had played a most interesting part. It was a common thing for a German to stroll into a colliery proprietor's office and suggest that recovery plants should be put down. The colliery manager usually ridiculed the idea when he was told that it would cost £60,000 to instal such plant; and the result was that the German, in almost every case, offered to put down the plant free of charge and take payment in the benzol obtained with it—leaving the colliery proprietor the sulphate of ammonia and other products. It was in this way that so many contracts were made under which a large proportion of the benzol was exported to Germany and used in the aniline dye industry. Last year 16 million gallons of benzol were made, of which some 6 millions were exported. The year 1914, however, was a troublesome one for Germany. They had put up recovery coke-ovens in order to get benzol as a motor fuel, and they were making an excess of metallurgical coke. Unfortunately for the oven owners, there was a slump in pig iron. The market for metallurgical coke was entirely dependent on the iron and steel market; and the effect of the slump in pig iron at once made the market extremely bad for coke. Many coke-ovens had to be stopped absolutely. There would, however, be a big boom in iron which would improve the trade enormously in these directions. At the present time, however, some of the principal collieries were thinking of putting down carbonization plants to treat coal at lower temperatures, in order to obtain a smokeless domestic fuel and at the same time increase the quantities of residuals which would be required for some time to come as war material and dye material.

During the past two or three years there had been tremendous activity to obtain benzol; and certain enthusiasts were so confident that it was to be the fuel of the future that they talked about it as if petrol was done for. They had had, however, a rude awakening. The truth about the matter was that the yield of benzol, after sufficient purification for use in a motor, amounts only to an average of 1·8 gallons per ton of coal carbonized; and if the whole of the coal carbonized in this country had the benzol collected, it would amount only to less than one-third of the quantity of petrol needed. The total amount used in 1914 as motor spirit was only about 9 million gallons; and it was for this reason that there was no doubt that alcohol would be the motor fuel of the future. At present, unfortunately, the grandmotherly legislation which governed the manufacture of alcohol for commercial purposes prevented it being manufactured at a less cost than about 2s. 4d. or 2s. 6d. per gallon; whereas it could be made at 6d. per gallon without the legislative restrictions which now obtained. This was the so-called duty-free alcohol. Already Germany was experiencing a shortage of petrol, and had debarred private car owners from using it, with the result that perperfectly satisfactory results were being obtained with a mixture of 80 per cent. of alcohol and 20 per cent. of benzol, to which was added 200 grammes of naphthalene per gallon. This enterprise on the part of Germany in evolving a form of carburettor which enabled such a mixture of home-made products to be used was a striking object-lesson of what we were losing by hampering the manufacture of alcohol.

GAS-ENGINE PLANT IN USE AT A SOUTH WALES COLLIERY.

Some interesting details as to a large gas-engine plant at the Bargoed pit of the Powell-Duffryn Steam Coal Company have been given in a paper to the Institution of Electrical Engineers by Mr. C. P. Sparks, the Consulting Engineer to the Company.

There are a hundred working ovens of the Koppers and Simplex regenerative type; the average quantity of coal carbonized being 4700 tons per week, and the average output of coke 3800 tons. The installation of this gas-engine plant is part of a scheme for dealing with small coal. The "smalls" from the Rhymney Valley are washed and mixed at Bargoed. After extracting the nuts, beans, and peas, the smaller sizes—less "duff," which is used for patent fuel—are delivered by aërial ropeway to the ferro-concrete coke-oven bunkers holding 1200 tons. The whole of the gas from the ovens is treated for bye-product recovery. After passing through cooling towers, the tar (averaging 56 lbs. per ton of coal carbonized) is extracted; this being afterwards distilled into creosote oil and pitch. Sulphur is then extracted by oxide of iron; the iron sulphide being made into sulphuric acid, part of which is used for fixing the ammonia. Something like 19 lbs. of sulphate of ammonia are produced per ton of coal carbonized. About half the total quantity of gas is required for heating the ovens. The balance, which is used for the following requirements, is delivered to a gasholder having a capacity of 300,000 cubic feet:

(1) Gas-engines	12,040,000	average number of cubic feet per week.
(2) Sale to gas company	3,000,000	
(3) Firing boilers	3,710,000	

Mr. Sparks expressed the hope that the sales to the gas company would increase, as it was very profitable business to the colliery company.

The analysis of the gas is as follows:—

Hydrogen	56·4 per cent.
Methane	20·5 ,,
Carbon dioxide	1·8 ,,
Heavy hydrocarbons	1·9 ,,
Oxygen	0·9 ,,
Carbon monoxide	4·7 ,,
Nitrogen	13 8 ,,

The thermal value is 400 to 410 B.Th.U.

The gas-engines are of the Nuremburg double-acting four-cycle type, direct coupled to fly-wheel alternators, one of 1000 k.v.a., and two of 2000 k.v.a. rating, running at 3000 volts and 100 r.p.m. The smaller set is of the tandem-type and the larger sets twin-tandem, developing, at normal full load rating, 600 B.H.P. per cylinder. A new set has been decided upon, in which the B.H.P. per cylinder will be 1200. The cylinders of the existing machines are 34-inch by 43-inch stroke; the weight of the flywheel of the 2400 B.H.P. sets, 76 tons; and the diameter of the shaft, 30 inches. These plants were originally worked at average loads of 700 and 1400 kw. The combined maximum load for one large and one small set is 2500 kw.; the usual practice being to run one large gas-engine continuously and the smaller gas-engine during the day-shift. When working at these loads, the cost of repairs was found to be unduly high on cylinders, pistons, piston rods, and exhaust valves; and the plants are now worked at average loads of 600 and 1200 kw.—the combined maximum load being 2200 kw. Since modifying the rating of the plant, the life of the pistons, piston rods, and exhaust valves has increased and no cylinders have been cracked.

Tests showed that the heat consumption of the 2000 k.v.a. sets was: At full load, 12,800 B.Th.U. per kw.-hour; at half load, 20,400 B.Th.U. per kw.-hour. With an annual output of 14 million units and a maximum load of 2200 kw., the annual load factor of the gas-engine station is 72 per cent.

Mr. Sparks also stated that twice as much electricity per heat unit is obtained with gas as with live steam; and he claimed to have made the installation a thoroughly successful one.

GAS FURNACES FOR INDUSTRIAL PURPOSES.

The Heat Treatment of Metals.

In the Free Gardeners' Institute, Edinburgh, last Friday evening, Mr. J. Lord, the Managing-Director of the Manchester Furnaces, Limited, delivered, in accordance with an arrangement with the Edinburgh and Leith Gas Commissioners, a lecture, with practical demonstrations and illustrated by limelight views, on "Gas-Furnaces and their Relation to the Heat Treatment of Metals."

In his prefatory remarks the lecturer expressed his pleasure at having the opportunity of giving his lecture, and said that if we could only bring the same power and usefulness to bear upon the German army that we secure by the use of gas for industrial purposes, the present terrible war would not last half the time that was anticipated. The German nation recognized its advantages years ago, and adopted its use in many of its trades. The United States have also extensively introduced the use of both town and producer gas in a great number of engineering trades. Scotland is also fighting for a "place in the sun" in the use of gas as a fuel. Mr. Lord then referred to an installation which was put down a short time since for a large firm in Glasgow, consisting of a batch of gas-furnaces to replace others using solid fuel. The new installation proved a great success, and resulted in the turning out of a superior quality of work. A gain of two-thirds in floor-space had been secured; while there was, of course, an absence of smoke and soot in the workshop. As to the cost, the fuel bill for coal furnaces amounted to £694 per annum; but the gas consumption for seven furnaces per day was 20,000 cubic feet, which, reckoning 300 working days, gave a total consumption of 6 million cubic feet per annum. This at the price charged for gas for industrial purposes worked out at approximately £425; showing a saving in fuel alone of £269 a year. Further, the waste heat from the gas-furnaces was utilized to heat the japanning oven. This saving is purely on fuel cost alone; but another 25 per cent. must be added for the saving in labour, space, and, above all, cleanliness.

Another case cited by the lecturer was that of a furnace put down in Glasgow, to use gas in place of oil for heating wire to make horseshoe nails. The oil-furnace, to heat the work sufficiently, required 4 gallons of oil per hour, costing 1s. 8d. In addition to this, a large amount of oil was lost through leakage. This furnace was replaced by the gas one, the consumption being 330 cubic feet per hour. Taking the price of gas in Glasgow at 1s. 6d. per 1000 cubic feet, the cost per hour was thus 6d., with the same production of nails, against 1s. 8d. when using oil—a saving of roughly 70 per cent. in the cost of fuel. As there was no storage required for oil, no pumping arrangement from barrel to tank, no unnecessary leakage, and no dirty surroundings, the lecturer considered that a saving of 80 per cent. was being made on this furnace.

These comparisons, said the lecturer, bring to my mind another instance of using ordinary gas. This was again a case of a furnace in Glasgow, used for re-heating after carburizing. The size

of the furnace was 3 ft. by 2 ft. and 12 in. high; the temperature used was 850° C.; and the fuel employed producer gas. The consumption was 1250 cubic feet of gas per hour, its calorific value being 120 B.Th.U., and it was used with air under pressure. The cost of this gas was put at 3d. per 1000 cubic feet, figuring fuel and labour in producing it. Therefore to run the furnace cost 4d. per hour. This furnace was transferred over to ordinary gas, costing 1s. 6d. per 1000 cubic feet. The consumption was then 250 cubic feet per hour, representing a cost of 4½d. Unfortunately, in the case of producer gas, the cost does not end there. Those who use producer plants know that maintenance and repairs run into many pounds per annum, and many times with indifferent pressure and supplies. By using town's gas you can always rely on the quality, and on its calorific value, and by no other system of heating can you obtain this. If you use coal, you seldom get the same results from each truck. If you use oil, you cannot rely upon getting two barrels alike, and, as the market stands to-day, at the same price. In using producer gas, your quality, pressure, and supply, constantly vary. In all fuels to-day for heating purposes, the prices are inclined to rise.

Gas is used in practically every industry in the country; but to enumerate them would take up too much of your time. What I believe we are most interested in this evening is gas-heated furnaces for the engineering trades, such as for heating bars for forging, tubes for welding, springs for tempering, case-hardening, re-heating, hardening of tools, rivet making and rivet heating, and brass melting. The furnaces used in the engineering trades are becoming exceedingly numerous. There are many types and designs of furnaces, and practically every operation requires a different type of furnace. For instance, we could not use the same furnace for heating springs as for welding tubes; hence every class of trade must have a special design suitable to its own particular requirements. It would therefore be as well to review some types of furnaces relative to the subject.

Draught Furnace v. Blast Furnace.

The draught furnace is a type where the burners are of the bunsen or atmospheric type, no air being required under pressure, the burner itself drawing in sufficient air for combustion purposes. This class of furnace is good for temperatures up to 1000° C. or 1832° Fahr. As high as 1300° C. has been obtained in this class of furnace; but for manufacturing purposes I consider that it is of no value, for many reasons. In the first place, the cost of running is excessive, both in the amount of gas used and the length of time required for recuperation purposes. I am not a great believer in draught furnaces, where, if possible, blast-type furnaces can be used. With these furnaces you increase your output by 25 per cent., using the same amount of gas. I wish it to be thoroughly understood that all the figures I give you to-night are not laboratory tests, but workshop experience. We will take a small furnace upon which a test was made; the temperature desired being 1200° C. To reach this temperature in a draught furnace took 3½ hours with a gas consnmption of 520 cubic feet. In the blast-type furnace, it took 42 minutes with a gas consumption of 170 cubic feet. This is five times quicker to heat-up, with a saving of 350 cubic feet of gas. The gas pressure in both cases was the same; 25-10ths air pressure used on the blast-furnace was 1½ lbs. per square inch. To maintain this temperature in the draught furnace took 200 cubic feet of gas, against 130 cubic feet in the blast furnace. These consumptions are when working the furnace empty.

The practical test of the furnace is when you begin to insert material. Therefore I took a test on the same furnace under these conditions, principally to note the recuperation of the heat. I inserted a piece of steel, the weight being 20 lbs., and the same was used in both furnaces. The first test was made in the draught furnace. Before the steel was inserted, the heat stood at 1260° C., and the drop in the temperature after the steel was inserted was 210° C.; therefore the furnace stood at 1050° C. Noting recuperation at the end of one hour, the heat or temperature only stood at 1210° C. Had the piece of steel been allowed to stay in the furnace until the temperature of 1260° C. was reached, it would have been oxidized beyond use.

The second test was made in the blast-furnace, the temperature of which stood at 1260° C., before the steel was inserted. Afterwards it dropped 150° C.; making the temperature 1110° C. The time required to bring it back to 1210° C., equal to the draught, was 15 minutes. Therefore, you have 45 minutes' gain by using blast as against draught. In the blast type, it took 56 cubic feet, as against 150 cubic feet in the draught type, to recover the same temperature. From this you will readily see why I am a strong believer in the blast-type furnace.

High-Pressure Gas.

I show you another form of blast-furnace, in which instead of having the air under pressure, we reverse, and place the gas under pressure, but instead of the 1½ to 2 lbs. air pressure, which is generally required, the gas is under pressure of at least 10 lbs. to 20 lbs. It is necessary to have this pressure to get good results. The air is drawn in by injection; the burner being really a glorified bunsen burner. In making all gas-furnaces—the system I am advocating to-night—the burner plays a very important part, combined with the use made of those gases when you receive them from the burner. The position of the burner has also much bearing on the results. My experience with high-pressure gas has not been a happy one, due to the fact that I found I could always do better by working with air under pressure and gas at normal pressure.

Speaking of pressure, I think it would be well to make a note here that success in running a draught-type furnace is dependent entirely upon the pressure of gas used to produce the results. A manufacturer of furnaces is often confronted with the question of what the consumption of gas will be. This is in some cases very difficult to answer, especially where a draught furnace is concerned. I will give you a case. A test was made to find out what would be the result working with gas at different pressures. We made this test on a small standard furnace; the object being to reach a temperature of 1000° C. with gas varying from 10-10ths to 25-10ths, and the furnace used being one of the draught type. The first test was made with a gas pressure of 10-10ths. At the end of two hours' run we were unable to get to a higher temperature than 800° C. with a gas consumption of 165 cubic feet. With a gas pressure of 15-10ths we reached 1000° C. in 90 minutes with a gas consumption of 150 cubic feet; and after reaching this temperature we were able to maintain it with 89 cubic feet per hour. With 20-10ths pressure we reached 1000° C. in 70 minutes, with a gas consumption of 135 cubic feet; and with 25-10ths pressure we reached 1000° C. in 60 minutes, with a consumption of 125 cubic feet. Here again, the blast-type furnace proves successful. Very little difference was observed between the 15-10ths pressure and the 25-10ths pressure; and even the 10-10ths pressure could be used advantageously, but with lower air pressure.

Bar-Heating Furnaces for Forge Work.

This type of furnace is one of the most difficult to make work with town's gas, due to the fact of cold air being drawn in at the mouth. These furnaces are generally made in two forms. The consumption varies according to the number of inlets or holes in the side of the furnace, together with the weight of the material going through and the temperature required. Let us assume that the furnace in question is consuming 250 cubic feet of gas per hour to maintain a temperature of 1400° C. empty, and we decide to put 5 cwt. of bars through per hour. The consumption per hour to turn out this amount of work in a properly designed furnace should not be more than 750 to 800 cubic feet.

Tube-Welding Furnaces.

This class of furnace, using gas as a fuel, has proved very successful and very clean. A furnace was put down in Glasgow for this work, and I may mention that a great amount of prejudice existed when this was done. We inserted a 6-inch tube (cold), and brought it to a liquid state in less than three minutes; whereas in an oil-furnace used for the same work it took 4½ minutes to reach the same stage. The gas-furnace used 1000 cubic feet of gas per hour, as against 4 gallons of oil by the oil-furnace. We will assume this is equal in running costs; but the output of work was 50 per cent. more; and there were a cleaner atmosphere, cleaner surroundings, no oil storage, no pumping, and no leakages.

Heating Springs for Tempering.

The type of furnace for heating springs is in quite a different class. You can close-up the furnace and prevent cold air from entering. For the results of this system, I can only refer you to my previous remarks in the comparison of coal as against gas.

Brass Melting.

The operation of brass melting is becoming more popular, using gas as a fuel. Where economy, quickness of heating, and cleanliness are concerned, gas is the ideal fuel. I remember a test made on some furnaces which were placed in Glasgow. Glasgow has made rapid strides in the use of gas for industrial purposes. This test came out as follows: Starting the furnace hot, we had seven heats, and melted 100 lbs. each heat; therefore melting altogether 700 lbs. of metal. This took 1840 cubic feet of gas, or an average of 2·6 cubic feet of gas per pound of metal melted; the average time to melt 100 lbs. being 49 minutes. The cost of fuel or for gas to melt the 700 lbs. was 2s. 8d., using gas at 1s. 5d. per 1000 cubic feet. If we melt the same in a coke-fired furnace, our consumption of coke would average ½ lb. per pound of metal treated, or 2 lbs. of metal to 1 lb. of coke used; therefore to melt 700 lbs. would take 3 cwt. 14 lbs. of coke, which at 9d. per cwt. would be 2s. 4½d., as against gas at 2s. 8d. I want you to bear in mind that this is an exceptional running cost. My figures, as an average both for England and Scotland, are 1 lb. of coke per pound of brass treated, though I know firms who are doing this work at the cost stipulated.

The time taken to melt 700 lbs. of brass by gas was 5¾ hours, against 10 hours by coke; therefore you melt this amount in almost half the time by using gas as a fuel as against coke. Also with gas you have no storage charges, less labour for operating, and you do not have to rely upon labour to maintain your heat, your crucibles last longer, and you have cleaner surroundings. Therefore, if you add 25 per cent. extra cost for this difference, it would make your cost 3s. for coke, and 2s. 8d. for gas, and your work would be got through in half the time. These points are worth considering.

In connection with the lecture, reference may be made to a similar one delivered by Mr. Lord before the Western District Division of the Scottish Junior Gas Association rather more than a year ago, and given, with illustrations, in the "Journal" for Dec. 9, 1913 (p. 804).

TYPES OF STATION METERS IN USE.

The Venturi and Thomas Meters and the Pitot Tube.

In the "JOURNAL." for the 25th of August last (p. 453), an abstract was given of a report by Dr. F. WING, the Chairman of the Committee of the American Gas Institute on the "Measurement of Gas in Large Volumes," in which reference was made to the Venturi and Thomas meters and the Pitot tube. The report has since appeared practically in full in our American contemporaries; and from it the following additional particulars have been obtained in regard to the above-named appliances, all of which have been described in our pages.

THE VENTURI METER.

There are many cases in the different industries where very large volumes of gas are required to be measured and positive wet meters are prohibited by the enormous volumes of gas and the expense, which is disproportionate to the value of the gas and to the accuracy required. Such gases are air, natural gas, blast-furnace and other fuel gases, which may be delivered as a commodity, or need to be controlled in some operation. Also in the process of handling artificial gas it is sometimes desirable to know the amount in a case in which the expense or inconvenience forbids the installation of a station meter.

For these reasons much ingenuity has been exercised in developing reliable substitutes, called "inferential meters." One successful device is the Venturi meter. This is in the form of a contracted section of pipe laid in a pipe-line, and is comparatively inexpensive and convenient to instal. The amount of gas passing it can be calculated by observing the pressures in the line and in the narrow part, called the throat, with the data of the areas of the meter and the condition and properties of the gas in question. The throat of the Venturi meter causes decrease of pressure and increase of velocity.*

While the Venturi meter is very accurate if it is in good, clean physical condition and located with a considerable length of straight approach and the pressure readings are taken very accurately, it is handicapped by having a very complicated formula for the expression of the volume of gas. The computation of results is very tedious and not simple.

In respect to size, meters for gas are built for blast-furnace use to be placed in a 60-inch line with 28-inch throat, and would measure up to 3 million cubic feet per hour with a differential of 20 inches of water. This is not necessarily the limiting size. There is a notice of a patent by Mr. R. Kennedy in the "JOURNAL OF GAS LIGHTING" for 1913 [see June 10, p. 746] for putting a secondary inferential meter on the bye-pass between the inlet and throat, instead of using an integrating device.

From our correspondents we have received reports of experiences that are not unanimous in the satisfaction expressed. One reporter described a Venturi meter which collected deposits of naphthalene at the entrance, in the throat, and after the throat, and stopped-up the pressure holes. This deposition was then prevented entirely by steam-jacketing. From this arrangement or some other cause the measurement was very far out, and it was replaced by an electric meter, which, curiously enough, is not troubled by naphthalene, though some deposit has been noted in the entering pipe; and it measures consistently.

Measurements are reported by another gas company in the case of a 10-inch by 3¼-inch meter lately installed to measure fuel gas. The registering device here is calibrated to the total gas under standard conditions when the gas passing the meter is at 95° Fahr. and 9·6 inches water pressure and its specific gravity is 0·49. When the conditions are different a correction factor is used. The Venturi meter was on a line with a wet meter by which it was at first adjusted; but this is not so severe a test as putting a meter in service as it comes calibrated from the makers. The following were the metered results:

Time.	Wet Meter. Cubic Feet.	Venturi Meter. Cubic Feet.
11.30 a.m.	—	—
12.00	25,100	24,800
12.30 p.m.	52,200	52,000
1.00 ,,	82,850	82,500
1.30 ,,	112,700	112,500
2.00 ,,	143,450	143,500
2.30 ,,	174,900	174,800

A 12-inch by 6-inch Venturi has been connected to the station meter of the Providence Gas Company for a period of two years. This one gives very satisfactory agreement. The registering gauge was calibrated for the average conditions of the water gas made. This meter is intended to measure a minimum of 30,000 cubic feet per hour. We have some data (percentages) which show the comparison, and also the limitations:

Time.	Max. Fast.	Min. Fast.	Max. Slow.	Min. Slow.	For Month.
August	1·23	1·23	6·84	0·51	2·13 slow
September	1·66	0·79	3·78	0·40	1·54 ,,
October	3·52	0·30	5·10	0·31	0·98 fast
November	3·17	0·41	0·52	0·20	1·66 ,,

Average for the four months . . . 0·14 slow

NOTE.—Large errors are ascribed to shutting-down and starting.

* For a recent description of this meter, see "JOURNAL" for June 9 last (p. 707).

Careful comparative tests were made on April 13 and 14, 1914, between the 14 feet station meter and the Venturi meter which had a type "Q" register, graduated in cubic feet of free gas at 30 inches bar. and 60° Fahr. for 10-inch pressure and ·675 sp. gr. Both tests agreed closely on an average; but the data of the latter are given, since in that the rates of flow varied more.

The registrations of the meters are given, then the volumes corrected for pressure, temperature, and specific gravity:

Time.	Registration.		Corrected.		Venturi per Cent.	Venturi Minute Reading.	Manometer. In.	Loss of Head. In.
	Station.	Venturi.	Station.	Venturi.				
11 a.m.	62,000	64,000	62,750	63,750	+1·5	84,000	2·1	0·30
12 ,,	92,000	95,000	92,700	94,600	+2·0	96,000	2·7	0·35
1 p.m.	96,000	98,000	96,750	97,600	+0·9	92,000	2·5	0·33
2 ,,	94,000	95,000	94,600	94,700	+0·1	92,000	2·55	0·33
3 ,,	61,000	61,000	61,500	61,000	−0·8	62,000	1·25	0·15
4 ,,	61,000	60,000	61,500	60,000	−2·4	64,000	1·30	0·20
5 ,,	56,000	56,000	56,450	56,000	−0·7	64,000	1·25	0·20
6 ,,	57,000	57,000	57,500	57,000	−0·8	53,000	0·9	0·15
Totals	579,000	586,000	583,750	584,650	+0·15			

1·2 per cent. fast.

The variation of the specific gravity during the test was 0·668 to 0·677 by one apparatus, and 0·661 to 0·662 by another. It is to be noted that the manometer gives a good readable differential pressure for a small loss of head while the gas is passing through the meter—a great advantage over the Pitot and orifice types.

THE THOMAS METER.

The electric gas-meter invented by Professor C. C. Thomas is of the calorimetric type, in which the gas is heated or cooled, and its volume computed from the transfer of heat and the known specific heat of the gas which is passing*. Stated concisely, the action of the meter is this: The specific heat of 1000 cubic feet of illuminating gas is very close to 21 B.Th.U. The gas is heated by an electric heater, a constant amount—say 2°—and the heating is controlled by electric thermometers. The electric energy for heating can be measured very precisely. Then, since the heat equivalent of a kilowatt is 3415 B.Th.U., the volume in thousands of cubic feet measured is $3415 \div (21 \times 2)$ per kilowatt-hour.

One of the considerations in operating this meter is that the mechanism is much more complicated than that in any other measuring device. Since it is continually in motion, and must act with precision, this implies much more attention than is given to a station meter. The meter is easily checked and corrected during a short interruption of the measurement. The two factors are the temperature rise and the current.

It is possible with these meters to measure very large volumes of gas with a single unit. The one in Milwaukee has a capacity of 3 million cubic feet per hour. The usual range of accurate registration is 30: 1. These meters are now also furnished with a range of 50: 1.

The Thomas electric meter has been regarded as reliable by several experimenters who have made very careful comparisons of it and the Pitot and Venturi meters, in measuring large volumes of air and natural gas. It appears to be winning favour in the latter field, where it is especially suited, on account of its large capacity for size and cost, to measure the maximum delivery from a pipe-line to a town on the line.

THE PITOT TUBE.

This is the most fascinating of all the devices for measuring gases, since its simplicity is attractive, and it contains the possibility of being an accurate means of measuring volumes. The principles of the Pitot meter are generally well known. The tube measures the velocity of the flow of gas at the point where it is located in a pipe, by showing the velocity head caused by the impact of the current on a pressure-gauge, the other arm of which is balanced by the pressure in the pipe, called the static pressure. As a means of measuring gas in large volumes, the method of inserting a Pitot tube in a main in a predetermined position can merely serve as a rough indicator, and may be wrong to the extent of 10 or 20 per cent., or even more. In order to profit by the possibilities of the Pitot tube for accurate measurement, it is necessary to be much more painstaking. The aperture to the static pressure connection must be such that it is not influenced by the current of gas. The pipe is divided into five concentric annular rings, and four readings are made in the centre of each ring on two diameters for the dynamic pressures, and the square roots of the twenty readings are averaged.

According to Mr. W. C. Rowse, who made some experiments in the laboratories of the University of Wisconsin, "the Pitot tube, as a means of measuring gases, is reliable within approximately 1 per cent. when the static pressure is correctly obtained, and when all readings are taken with a sufficient degree of refinement. In order to obtain this degree of accuracy, the Pitot tube should be preceded by a length of pipe twenty or thirty times the pipe diameter, in order to make the flow of gas as nearly uniform as possible across the section of pipe."†

The method of measuring large quantities of gas by calibrated orifices is "such a rough one that it would scarcely be applied to

* This meter was described in the "JOURNAL" for Jan. 21, 1913 (p. 186). It is in use at the Linacre works of the Liverpool United Gas Company, and attention was called to it by the Engineer (Mr. Edward Allen, M.Inst.C.E.) in his Inaugural Address to the Institution of Gas Engineers last June.

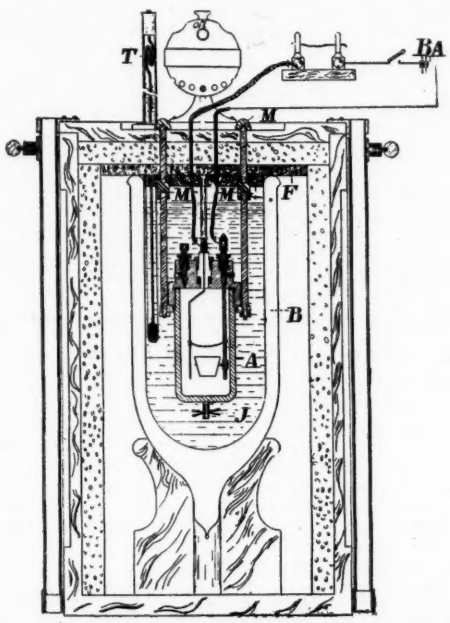
† Mr. Rowse's experiments were noticed in the "JOURNAL" for April 28 last (p. 266). See also paper by Mr. A. R. Griggs, Vol. CXX., p. 670.

artificial gas." There must be a considerable loss of pressure to obtain a significant measure of the quantity; and back-pressure is objectionable. The measurements by the Pitot tube and by calibrated orifices are both based on the same physical law, and involve the difficulty of reading slight differences of pressure. The Pitot tube has the advantage of not interfering with the flow of gas. But the process of searching the whole main for impact pressure is quite complicated, and gives results that are rather uncertain from the currents; and though taking a single observation is simpler, it is still more uncertain.

AN ADIABATIC CALORIMETER.

A recent number of the "American Gas Light Journal" contained the following particulars of the Riche adiabatic calorimeter, in which an attempt is made to eliminate errors due to radiation through the surrounding wall, conduction through the metallic parts and the thermometer, and inaccuracy of the thermometer readings, by the use of a vacuum cup having a suitable covering and insulating parts.

The instrument consists of a bomb A, of any type, a vacuum cup B, of standard size, containing water, a stirrer J, and a thermometer T. The bomb shown is of the Mahler-Kroeker porcelain type, good for 8000 combustions. The support for the bomb is a hinged ring, held by two brass rods connected with the cover.



The rods are insulated by passing them through hard rubber M; and a hard rubber cap is screwed on the end of each rod. To prevent loss of heat from the vacuum cup, it is surrounded by an oak box lined with 1-inch pressed cork glued to the wood. On the cover, in addition to the cork, is glued a piece of hair felt F half-an-inch thick, making a tight joint on top of the cup. A hinged door in the front facilitates the handling of the cup, and the cover is raised and lowered by means of telescope tubes, giving opportunity to place the bomb in the split ring and to adjust the ignition wires. After the cover is lowered, the thermometer is inserted through a hole in the cover.

The substance to be burned is prepared, weighed, and put in the bomb, which, after charging with 30 to 40 atmospheres of oxygen, is placed in the split ring and the wires connected. The water in the cup is brought to a temperature within *plus* or *minus* 5° of the room, the cup is placed in position, the door closed, and the top lowered. The thermometer is then adjusted and the stirrer started. Readings are taken until the temperature of the water shows constant for three successive minutes. Temperature equilibrium having been established, the bomb is removed, opened, and rinsed with water, and the rinsings are titrated with one-tenth normal alkali for nitric acid, using litmus as an indicator.

Ignition of the substance in the bomb is accomplished by a current from three 2-volt storage cells, which first passes through a 3-ampere fuse wire in series with a platinum wire inside the bomb. The platinum wire is connected to the substance to be burned by a linen thread of sufficient size to secure ignition. The fuse assures constancy of ignition heat.

While other types of calorimeter frequently require repeated readings, and a complicated system of calculations because of imperfect insulation, the Riche calorimeter needs only minute readings. It requires from three to five minutes for the temperature of the water to become stationary. The operator may ignite his material, and then do anything he pleases during the short interval following the final reading.

The reading at ignition is taken as the initial reading, and subtracted from the final reading gives the total rise. The rise multiplied by the weight of water (*plus* the hydrothermal equivalent of the apparatus) gives the total number of calories liberated. From this is taken the heat resulting from the ignition and the nitric acid formed. This result divided by the weight of the substance gives the calories for the unit of material oxidized.

It is claimed that the Riche calorimeter saves 50 to 75 per cent. of the operator's time, and is a perfect calorimeter device.

SYNTHETIC PRODUCTION OF AMMONIA.

Herr Bambach's Process.

Though the fixation of atmospheric nitrogen by metallic salts in the presence of coal and at a high temperature is known, no process based upon these reactions has hitherto been technically utilized; and experiments made with this object have had to be abandoned in consequence of the inferior quality of the product obtained. A process which allows of gas-producers being utilized to manufacture ammonia by synthesis has been devised by Herr Adolph Bambach. By its aid atmospheric nitrogen can be fixed in the form of metallic compounds, both carburetted and nitrogenous (cyanides, cyanamides, &c.), or metallic nitrogen compounds (nitrides), and these substances decomposed, either with saturated and superheated steam or with water, to extract the ammonia. Herr Bambach has patented his process for France, and an application for a patent for England has been made, but has not yet been accepted. The following particulars have been translated from the French specification [No. 469,331 of 1914].

It has been found that all kinds of producers can be employed to fix atmospheric nitrogen, utilizing coal, as well as salts, oxides, hydroxides, or metallic carbides. In applying the process which is the object of the patent, the mass of coal or the mixture containing it is prepared before or after filling the producer either with one of the products mentioned or an amalgamation of several of them; the addition being made in a solid form or in solution, and by injection or otherwise. The important reaction—viz., the fixation of the nitrogen—takes place in the zone of combustion in the producer; so that in the event of well-conducted continuous working, this part always contains metallic carburetted and nitrogen compounds with intermediary formation of carbides.

When the temperature of the zone of combustion has to be increased, this can be done by previously heating the air for alimentation before utilizing it for gasifying the coal. To obtain good thermal efficiency, this air can be heated by means of coils placed inside the producer jacket. By raising the temperature of the zone of combustion, the advantage is obtained that the fixation of the atmospheric nitrogen is greatly accelerated, and the production of combined nitrogen increases. This double advantage can also be obtained by adding a certain number of substances to the coal in the producer besides those already put in—viz., metallic salts, oxides, &c. These supplementary substances may be small quantities of magnesium chloride, calcium fluoride, &c., which, as demonstrated by experience, have the property of greatly increasing the production of fixed nitrogen per unit of time, as well as the rapidity of the reaction when atmospheric nitrogen is to be fixed. To extract the ammonia from the nitrogen compounds thus formed, a certain quantity of steam, which may be under pressure or superheated, is periodically driven underneath, inside, or above the zone of combustion, or into all these parts simultaneously. Finally, a certain quantity of water can also be sprayed at intervals into all these places. The carburetted and nitrogen compounds and the metallic nitrogen compounds are decomposed in the form of ammonia, which escapes to the exterior with the current of producer gas, water gas, or mixed gas, and is separated by washing or absorption.

Experience has shown that the temperature prevailing in producers might decompose the ammonia fumes when it is too great; and in some instances this decomposition may occur at 500° C. (932° Fahr.). To prevent this, the gas from the producer is cooled in a suitable manner. The products of metallic decomposition are found in the residue, from which they can be separated either by dissolution, utilizing their greater or less solubility, or else by special methods.

GAS LEAKS AND BITUMINOUS PAVEMENTS.

In the "JOURNAL" for the 29th of December (p. 740), an abstract was given of a paper on the subject of the effect of leaking illuminating gas on bituminous pavements, read by Mr. G. C. Warren before the American Society of Municipal Improvements. The statements made by the author attracted the attention of Mr. E. C. Jones, of San Francisco, the President of the American Gas Institute and the Pacific Coast Gas Association. The following are extracts from Mr. Jones's reply.

The writer of the article states that illuminating gas "not only attacks asphalt but combines with it, thereby increasing its weight." If this is so, it is equivalent to adding petroleum residuum to asphaltum containing too much asphaltene, and adds life to it by increasing its elasticity. The "attack" is like a man

assaulting his bank account by making a deposit. The hydrocarbons in illuminating gas which in a liquid form would most readily unite with asphaltum are benzol and its homologues. These appear in gas in quantities usually less than 1 per cent.; and in this "calorimetric" period of the gas business they are rapidly and permanently disappearing.

It has long been known to gas men that a large quantity of illuminating gas will dissolve a small quantity of asphaltum. The present writer has been compelled in emergencies to use cast-iron water pipe coated on the inside with asphaltum for conveying gas; and in every case the fluid asphaltum has been pumped out of the drips. It is also well known that illuminating gas in passing through soil will give up the hydrocarbons which combine with asphaltum. Gas containing 6·2 per cent. of illuminants when passed through 1 lb. of loam at the rate of 1 cubic foot per hour loses 1 per cent. of illuminants—nearly all benzol.

The article gives the impression that gas companies are following the lead of their electric friends in the wireless transmission of energy, and distributing pipeless gas, while the reverse is actually the fact. The distribution of gas, particularly in the city of Boston, has reached such a state of perfection that the amount of unaccounted-for gas when expressed as a percentage of the entire output is almost negligible; and not enough of this comes in contact with asphaltum pavements to maintain their elasticity against the ravages of summer heat and oxidation.

The writer of the article is correct in saying that "leaking gas follows the lines of least resistance;" and the line of greatest resistance in the ground should be upward through a 6-inch concrete base (so well mixed and graded that it is impervious to water) to reach the under side of an asphalt wearing surface. Leaking gas usually finds an outlet, and a frozen street surface will cause the escaping gas to travel transversely through the soil into cellars or sewers, particularly in eastern cities, where the winter frost seals up the streets and the gas mains are laid very deep. It is evidence of defective work to admit that gas will affect the under side of a layer of asphalt resting on a thick base of concrete, as all road specifications provide for the complete filling of voids in concrete, and the use of strong mixtures of cement and other material, so that the solid mass is impervious to water.

From the view point of the gas company, the waste of gas by leakage is expensive and unnecessary; and no leak of sufficient size to harm a pavement, even were it possible, would remain undiscovered, but would be quickly repaired, as the cost of repairing the best pavement is not to be considered when compared with the continued loss of gas and the annoyance and danger from a leak. The present writer is familiar with the cases of supposed harmful effects of gas on asphalt pavements mentioned in the various books on paving; but a close study of these reveals the fact that they are mostly quoted from some other source, or refer to unpractical and non-conclusive experiments similar to those mentioned in the article. A clear diagnosis will prove that the much-abused gas companies are free even from the "mote" in their eyes in this hair-splitting effort to find someone to blame for faulty pavements.

CONTINUOUS METER READING.

One of the papers presented at the recent meeting of the Wisconsin Gas Association, in Milwaukee, was entitled "The Continuous Meter Reading and Discount System;" the author being Mr. F. J. Maxwell, the Auditor of the Eastern Wisconsin Railway and Light Company, of Fond du Lac. It was as follows.

On the 15th of April, 1914, the Company adopted what is known as the "continuous meter reading system." Before inaugurating it, we had a canvass made among the business men and others, and no serious objections were raised. We started it on the 15th instead of the 1st, so that the ledger clerks would have all the previous month's records completed. Under the old method we had one or two regular meter readers, and would have to draft others from the fitting department, distribution, or street railway department to read meters from the 16th to the 28th, and deliver bills and collect from the 28th until the 6th or 7th of the following month. This not only caused confusion in these departments, but made it necessary to find other work for the regular readers during the time they were not reading.

Under the new system the map of the city and the village of North Fond du Lac is divided into 25 districts, to correspond with the 25 working days of the month. One district is read each day, the bills for that district are made out and dated the next day, and are delivered on the third day by the collector, who is instructed to collect as many bills as possible while delivering, as the majority of the people would rather pay the collector than make a trip down town for the purpose. When we mapped-out the districts we did it in such a way that the reading of the meters and delivery of bills in the districts containing factories and railroad shops would be done at the same time of the month as that at which they pay their employees.

We have 6174 gas, electric, and power meters in use, and one man reads them all in 25 days—an average of more than 240 meters per day. If the meter reader is unable to read a meter on the regular day for a given district, he leaves a return post card, on which appear two diagrams of dials and a request to the consumer to draw lines representing the hands as they appear on the meter, and mail us the card. A list of these is made up each day, and if the card has not been returned before the collector is ready to deliver the bills, he takes the list, and reads the meters in the district in which he is collecting. There is no "covering the ground twice" to read the list which we used to call the "stragglers' list." Our meter reader and collector each wears a badge, and carries with him a certificate signed by the general manager.

With the natural increase in business which has occurred, it has not yet been found necessary to put on an additional man to read meters. As the gain continues, it may require an additional man at first, possibly for one day a month, which can easily be arranged for. This system can be expanded almost without limit; and by having the same man read the same meters continuously he can keep the Company informed as to the general conditions. The man to employ must be familiar with both gas and electric meters, their connections, &c. He should bear in mind that it is no lazy man's job but that accuracy must not be sacrificed for speed, and that courtesy goes a long way towards establishing pleasant relations between Company and patrons.

Two important advantages in the new system are the billing and the discount day, both of which we have found to be great improvements. With the old system, all billing was done with a rush at the end of the month, which gave larger opportunity for incorrect billing; whereas the new system spreads the work evenly through the month. Complaints of any kind also are scattered through the month, and can be given a better investigation. They need not be "advertised," as they were under the old method, when, with only one final discount day, a number of customers would line-up at the cashier's window all at one time, and witness the adjustment of complaints of those who were ahead in the line. With the new system every day is discount day. If the bill is dated the 15th, we rubber-stamp at the bottom of the bill "Last day for discount on this bill is the 25th;" a bill dated the 16th is stamped "Last day for discount on this bill is the 26th," and so on. The daily collections are, therefore, more equalized, and we are enabled to get our money more promptly, with less chance of loss with the class of people we call "floaters," the limit now on such a class being one month and 16 days; whereas with the old method it would be as much as two months and four days. We also have the use of one-third more money from our sales much sooner under this system than under the old. With very little work, it is possible to know, every day, the situation as to our accounts receivable.

Convertible Combustion Engines.

This subject was dealt with by Mr. Alan E. L. Chorlton, of Lincoln, in a paper submitted by him at the last meeting of the Institution of Mechanical Engineers. He explained at the outset that his object was not to advance the claims of either the gas or the oil engine, but rather to direct attention to the possibilities of a convertible engine designed to use both fuels advantageously. He remarked that, in surveying the problem in general, one might at first say that the combustion engine most ready to work on differing fuels would be of the self-ignition type, with a cycle approximating to that of constant pressure, in which the heat of compression was always sufficient to ignite the incoming fuel, whether solid, liquid, or gaseous; and the only change necessary in going from liquid to solid would be in the fuel-injection device. In practice, however, owing to the difficulty with solid fuel injection, such a type would not prove workable; and even when the fuel was first gasified the results did not justify the complication. In the author's opinion, the problem of designing an engine was better met, especially on the grounds of simplicity of, and suitability for, every-day use, by trying to combine known types for gas and oil in which good results are obtained at the present, and which, in general principles, show the same characteristics. He proceeded to consider different types of engines and methods presenting advantageous possibilities. The conclusion he came to was that, for powers up to (say) 1000 B.H.P., the type represented by the Ruston four-cycle 520 B.H.P. oil-engine is the most suitable as a convertible engine; while for still higher powers, when tandem engines and size and weight of removable parts become a problem, Mr. Dugald Clerk's super-compression type offers very interesting and hopeful possibilities.

The World's Oil Production.—The "Petroleum Review" estimates that the world's oil production in 1914 amounted to 58,030,000 tons. The United States produced 42 million tons; Russia, 5,460,000 tons; Mexico, 3,600,000 tons; the Far East, 1,800,000 tons; Roumania, 1,770,000 tons; British India, 1,100,000 tons; Galicia, 700,000 tons; other countries, 1,600,000 tons.

Society of British Gas Industries.—The programme has been issued of the annual general meeting of the Society of British Gas Industries, which is to be held at the Trocadero Restaurant on Thursday, the 18th inst. Afternoon tea (by invitation of Mr. J. W. Broadhead, the Chairman of the Council) will be followed by a business meeting. The subsequent proceedings will consist of an address by the new Chairman of the Council (Alderman F. Templer Depree), entitled "A Brief Review of Ten-Years' Experience of the Gas Industry, and Progress during the Period;" and a paper by Mr. R. J. Milbourne, on "A Trade that might be British." The business proceedings will be followed by dinner and a musical entertainment.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Recovery of Toluene from Coal Gas.

SIR,—For the same reason that the gist of Dr. Davidson's communication to you on the subject of tar distillates, in the current issue of the "JOURNAL," appears above the authority of the "ED. J.G.L.," I have asked Mr. Evans to defer public reference thereto until after the war.

CHARLES CARPENTER.

South Metropolitan Gas Company,
Old Kent Road, S.E., Feb. 27, 1915.

[The war may be a long one; but the longer it is, the greater will be the accumulation of experience regarding, among other matters, toluene in gas and tar.—ED. J.G.L.]

Domestic Use of Coke—Science v. Superstition.

SIR,—May I inquire whether any of your readers is acquainted with what appears to be a widely-prevalent belief (especially among the working classes) that wet coke burns better than dry, with a brighter glow and lessened evolution of sulphur fumes?

The origin of traditional beliefs is of interest when the belief is widespread and sincerely held. Is this belief with respect to coke based on superstition, or has it arisen from erroneous deduction from observed facts? There are two current beliefs with respect to fires which may serve to illustrate my meaning. The first is a belief that a bright light will extinguish a fire. One has often seen a fire screened from sunlight or from a lamp. This is a case of erroneous deduction from observed facts. The second is a belief that a poker set up at right angles with the grate makes the fire burn. This latter belief, according to Dr. Johnson, is based on superstition. Here is the extract from Boswell's "Life of Johnson:"

> "BOSWELL: 'Why, Sir, do people play this trick which I observe now, when I look at your grate, putting the shovel against it to make the fire burn?'"
>
> "JOHNSON: 'They play the trick, but it does not make the fire burn. *There* is a better' (setting the poker perpendicular up at right angles with the grate) 'In days of superstition they thought, as it made a cross with the bars, it would drive away the witch.'"

Does the prevalent belief with respect to the advantage of using damp coke rest upon a basis equally ancient and respectable? I fancy not. It is certainly in conflict with the dictates of common sense, and with modern gas-works practice as disclosed by frequent references in the Technical Press to the ideals of gas managers [*vide* "JOURNAL," Feb. 2, 1915, p. 251.]. But the sincerity with which the belief is held is undoubted, though one may smile at its simplicity.

As a special constable, I have mixed with all sorts and conditions of men. Beneficent authority provides us, while on duty, with a coke-fire in a brazier; and much amateur stoking is directed, at all hours of the day and night, to encourage combustion in face of adverse conditions. The coke supplied for our use is of very varied quality, and on one occasion included a consignment of spent material from the contact beds of a sewage farm, the very recollection of which sends a cold shiver down my back! On the rare occasions when the coke has been dry, I have witnessed a confederate hand thoughtfully damping the lumps before making up the fire; and a pail of water is frequently placed beside the brazier in the open air, "to kill the sulphur fumes." When wet, the condition of the coke has been hailed with enthusiasm, as affording the promise of a fire of unusual brilliancy "when the coke has burnt up;" and in the early hours of yesterday morning, when the snow was falling fast at 3 a.m., the crowning act of faith was manifest when, obedient to the command of a fellow constable—a gardener and a very worthy man—I deposited a shovelfull of snow on the struggling fire "to make it burn up quicker." We watched the red-hot coke blacken as the snow melted; but my friend only remarked gravely: "You will see it flare-up presently when the water gets into the coke." I did not even smile; perhaps the environment was not conducive to merriment. When the fire ultimately did recover under the influence of a steady wind blowing from the North, the fact was triumphantly acclaimed as affording one more proof of the soundness of my friend's views. He saw the snowflakes fall hissing on the fire, and the flames leap up as the wind drove through the bars in gusts; and he drew the conclusion that the increased rate of combustion was due, not to the more powerful draught, but to the damp air and falling snow.

Is it possible that others have reasoned in the same way; and that thus hypothesis has become theory, and theory elevated into the dignity of a creed? I don't know. "There is nothing new under the sun," and possibly in the remote past one might have seen neolithic man gravely pouring water on prehistoric wood to make it burn more brightly.

ERNEST LINDER.

87, *Canfield Gardens, South Hampstead, N.W.,*
Feb. 25, 1915.

Southgate and District Gas Company.—At the half-yearly meeting of this Company last Thursday, the Directors reported that, compared with the six months ended Dec. 31, 1913, the sale of gas showed an increase of 2,257,400 cubic feet, or 2 per cent., and the revenue from residual products a reduction of £795. The balance of profit was £7195; and the Directors recommended the declaration of dividends for the half year at the rates of 5, 10, and 7 per cent. per annum on the preference, original, and additional capital. The payment of these required £4112, and left £3083 to be carried forward.

REGISTER OF PATENTS.

Proportional Flow Meter.

MELLERSH-JACKSON, W. J.; a communication from the CUTLER-HAMMER MANUFACTURING COMPANY, of Milwaukee, U.S.A.

No. 27,174; Nov. 25, 1913.

This invention relates to improvements in meters, concerning which the patentee remarks: Wherever it is necessary to measure very large quantities of gas, it has been recognized generally that it is desirable to direct a small portion of the flowing fluid through a bye-pass and measure the flow thus diverted from the main body of fluid. The total flow may then be estimated if the ratio of the quantity of diverted fluid to the main body of fluid is known or can be determined. It has been very difficult heretofore to determine and maintain accurately the ratio of the quantity of fluid bye-passed to the total quantity of fluid; and for this reason measurements based on this method have not been satisfactory. Among the various difficulties encountered it may be mentioned that when a meter is located in the bye-pass, the resistance offered to the flow of fluid causes a deviation from the proportion of flow which would otherwise take place. If the error is corrected by making a suitable calibration at some particular rate of flow, the correction does not hold for a different rate of flow; and if the error is corrected by making a calibration when all the passages are clean, the correction or calibration does not hold after dirt, tar, rust, &c., has been deposited on the parts and passages. It has been suggested to obviate the error by controlling the main and proportional flow passages by valves which are interconnected and automatically regulated by the pressure of the gas acting through suitable means—such as flexible diaphragms; but the action of such moving parts is liable to be interfered with by dirt, rust, tar, and so on.

These objectionable features have been found to exist, particularly where measuring elements are used which depend for their operation upon the pressure of the fluid against them. They are also known to exist to some extent when the measuring element is of the type described in Carl C. Thomas's patent, No. 30,405 of 1909, in which the flow is measured by the determination of the effect of a known amount of heat dissipated into the flowing gas. In using a meter of this type, it is particularly desirable, the patentee remarks, when very large quantities of gas are to be measured, to use the proportional method of measurement, as without some such arrangement the electrical energy required to heat large quantities of gas would involve considerable expense, and it has been proposed to obviate this disadvantage by dividing the gas-conduit into a plurality of branches of equal size and inserting a measuring element in each of the above-named type.

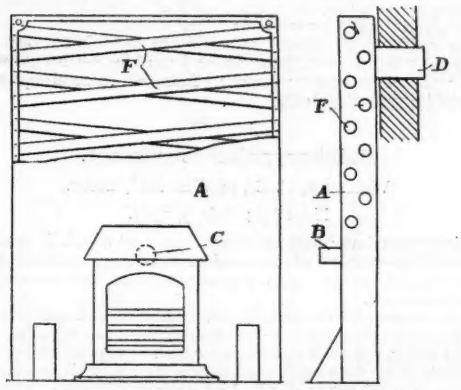
The present improvement is directed towards proportional meters provided with thermally operating metering elements; the object being to construct a proportional meter of increased accuracy and efficiency without the aid of moving parts. To this end means are provided, of the stationary type, for dividing the flow into fixed, definite proportional parts independently of the metering elements; also in some cases the parts are arranged so that one passage is jacketed by the other (as has been done in liquid meters having moving metering elements), or that the passages containing the thermally operating metering elements are jacketed by the fluid being measured.

Radiator Combined with a Gas-Stove.

SWIFT, S., of Sheffield.

No. 29,487; Dec. 22, 1913. Redated June 23, 1914.

A radiator made in accordance with this invention comprises a flat box-like structure having an inlet from the stove and an outlet to the chimney or flue, and provided with inclined open-end tubes disposed parallel with the face of the radiator—half inclined upwards to the right and half to the left.



Swift's Combination Gas Stove and Radiator.

An elevation is given of a stove and radiator with part of its front plate removed to show the interior; also a side view of the radiator to show the open ends of the tubes.

The radiator A is provided near the bottom with an inlet opening B for connection with the outlet C from the stove, and having an outlet D near the top for the escape of the heated air or gases into the room chimney. The interior of the radiator is provided with round tubes F, parallel with the face of the radiator, and with their ends opening through the casing into the room.

The patentee says he is aware that it "has been proposed to employ,

in combination with a gas-stove, a chamber through which open end tubes are disposed in pairs oppositely inclined." What he claims as his invention is: "A radiator for use with a gas-stove comprising a flat box-like structure having an inlet from the stove and an outlet to the chimney or flue, and provide dwith inclined open-end tubes disposed parallel with the face of the radiator, half of the tubes being inclined upwards to the right and half upwards to the left."

Clockwork Mechanism for Operating Gas-Valves.

HORSTMANN, E. H., G. O. H., & S. A., and EDGAR, W. T., of Bath.

No. 165; Jan. 3, 1914.

This invention relates to clockwork mechanism in which a dial-plate is made to rotate once in twenty-four hours, and which carries in its daily rotation one or more tappets capable of adjustment to predetermined times; the purpose of the tappets being to effect, through the medium of an operating lever, the discharge of a gas-cock or the like, as in patent No. 14,825 of 1911.

The present invention differs from the prior state of the art in that the means provided for effecting a series of two or more angular displacements of the gas-cock plug in one direction and one or more in the opposite direction—by mechanism operated by a series of tappets or sub-tappets arranged on a rotating dial-plate, acting through the medium of an operating lever—are characterized in that the sequence of the series of operations "is constantly maintained by the selective or discriminating nature of one or more, but not all of the tappets [by selective or discriminating is meant, capable only of effecting a particular angular displacement of a gas-cock plug]."

In the 1911 patent the discrimination was effected by means of a stud or pin projecting from each of the tappets that was intended to divert the movable thrust element of the discharge lever from its normal course. In practice it was found that, in order to ensure efficiency in this method, great care had to be taken in the adjustment of the various parts. It was also found that the maximum leverage of the arm or plate of the gas-cock plug was also restricted. It was also known that two tappets were employed (one of the two being repeated) acting in a direct manner upon the gas-cock plate, instead of through the medium of an operating lever—the trip element in such arrangements not forming a medium between the tappets and the gas-cock plug or plate as is the case with the operating lever according to the invention formerly claimed.

In carrying out the present invention, the movable thrust-element of the operating lever is provided with a thrust-pin, projecting at right angles from its surface, so that when an operation occurs the pin will engage in one of a number of shaped recesses in the arms of the plug of the cock, and, by a method described in the specification, a number of angular displacements of the gas-cock plug and a variety in the series of same may be obtained.

The patentees further provide means whereby, when desired, an angular displacement of the gas-cock plug may be effected during the lifting—that is, while the operating lever is preparing or storing energy for the operation of the gas-cock plug.

The invention is not further described apart from sheets of drawings containing a number of closely lettered figures.

Clockwork Mechanism for Controlling Gas-Valves.

HORSTMANN, E. H., G. O. H., & S. A., and EDGAR, W. T., of Bath.

No. 415; Jan. 7, 1914.

This invention relates to gas-controllers and the like in which the dial-plate (rotating once every twenty-four hours) carries in its daily rotation one or more tappets capable of adjustment to predetermined times, with the object of operating the cock, to turn on and off the gas. It also relates to a type of instrument in which a time mechanism and a mechanism which controls the supply of illuminant are actuated by one and the same spring—the time mechanism being driven by a going barrel, as in patent No. 23,161, of 1909; the latter by the rotation of the barrel arbor, the ratchet work of which is attached to the main wheel of the illuminant train. The object of the present invention is to render such gas-controllers more suitable for work in conjunction with lighthouses, beacons, and the like, by the provision of certain "failure prevention devices," described in detail by the aid of a series of lettered diagrams.

Sulphocyanide Treatment.

WILLIAMS, P. E., of Wanstead, Essex.

No. 2841; Feb. 3, 1914.

This invention has reference to the treatment of alkaline and other sulphocyanides—particularly ammonium and calcium sulphocyanides—with the object of recovering the nitrogen in the form of ammonia or an ammonium salt.

For this purpose it has heretofore been proposed, the patentee points out, to heat the sulphocyanide in the presence of an alkali or alkaline earth and water, whereby it is converted into sulphide and carbonate of the alkali or alkaline earth used which remain, while ammonia and carbon oxysulphide are evolved. In this method, however, the evolved ammonia and carbon oxysulphide react upon each other to a considerable extent—"resulting in the production of urea and sulphuretted hydrogen, so that the final yield of ammonia is considerably below the amount originally produced."

The object of the present invention is to avoid this "serious disadvantage," and thus increase the yield of ammonia. To this end the ammonia and carbon oxysulphide produced by heating the sulphocyanide in the presence of an alkali or alkaline earth and water is caused at once to pass into a layer of a hydroxide of an alkaline earth whereby the ammonia is allowed to pass away free as ammonia while the carbon oxysulphide is decomposed, with formation of sulphide and carbonate of the alkaline earth used and water. The sulphide of the alkaline earth thus obtained can be treated by any suitable method for the recovery of the sulphur.

In carrying out the invention in connection with the treatment of a solution of calcium sulphocyanide prepared from ammonim sulphocyanide as obtained in gas-works (and, for example, in the manner described in patent No. 23,624 of 1909), the solution may be evaporated nearly to dryness; then mixed with slaked lime; the mixture covered with a layer of slaked lime; and the whole gradually heated in a closed chamber to a temperature of (say) 500° to 600° C. In this way, the nitrogen and sulphur in the calcium sulphocyanide are converted into ammonia and carbon oxysulphide—probably according to the following equation:—

$$Ca(CNS)_2 + Ca(OH)_2 + 2H_2O = 2NH_3 + COS + CaS + CaCO_3.$$

The carbon oxysulphide at once passes into the layer of calcium hydroxide, and forms with it calcium sulphide, calcium carbonate, and water—probably according to the following reaction:—

$$COS + 2Ca(OH)_2 = CaS + CaCO_3 + 2H_2O.$$

The ammonia evolved with the carbon oxysulphide, being thus freed from the latter substance, passes unchanged through the layer of slaked lime and flows from the heating chamber. The ammonia obtained may be directed into sulphuric acid for conversion into sulphate of ammonia or be otherwise dealt with as desired.

The mixture of calcium sulphocyanide and slaked lime may conveniently be placed as a thick mass in an iron receptacle, and be covered with a layer of calcium hydroxide—*e.g.*, slaked lime—of (say) 2, 3, or more inches in thickness, and the receptacle placed in a chamber of fire-clay or other refractory material heated externally, after the manner of a muffle, to the temperature already mentioned; the ammonia produced being led off through an outlet pipe. In order to maintain a moist atmosphere within the chamber for the purpose of providing the necessary water for effecting the reaction indicated, and for effecting the ready removal of the ammonia, a vessel constantly supplied with water may be placed in the chamber, or a jet of steam (with or without air) may be introduced into the chamber. The ammonia may be passed into a closed vessel containing sulphuric acid, the upper part of which may be connected to an air-pump or gas-exhauster.

The calcium sulphide may be treated in any known way, as by passing through it carbon dioxide in the presence of water, to produce calcium carbonate and sulphuretted hydrogen, which latter can be treated by any of the well-known methods to produce sulphur or sulphuric acid.

Purifying and Treating Town Gas.

KOECHLIN, D., of Paris.

No. 5764; March 6, 1914.

In the words of the patentee: This invention relates to a process which allows of manufacturing town gas in a more rational way than hitherto, so as to increase its candle power and calorific effect. The fractional distillation of coal is carried out for this purpose in such a manner that the gases and vapours contained in the first fraction—that is to say, the fraction containing the higher hydrocarbons, C_6H_6, C_7H_8, $C_{10}H_8$, &c.—are made to undergo special treatment; while the gases of the second fraction of distillation—mainly, CH_4 and H_2—which does not contain an appreciable proportion of the higher hydrocarbons, are subjected to a catalytic action, whereupon the gases obtained by these two fractions are mixed, so as thus to produce town gas, that, while being of a high degree of purity, has a higher candle power and calorific effect than is usually the case.

It has already been proposed in a prior patent [No. 4829 of 1914] to increase the calorific effect of the first fraction of the gases given off by passing this fraction through a chamber heated to red heat, and to subsequently mix the gases obtained in this manner with those of the second fraction on having passed the latter over heated nickel in a known manner. But it has been found that by passing the gases of the second fraction first over heated iron oxide and immediately afterwards over metallic nickel, the yield in methane (and consequently the candle power of the gas) can be very considerably increased.

The treatment of the gases of the second fraction of distillation is carried out by using an apparatus that serves simultaneously for heating and purifying these gases and producing the catalytic action required for increasing their contents in methane.

In carrying out the invention, the gases and vapours given off during the first fraction of the distillation of coal, and containing a fair amount of carbon, are passed into a chamber [no illustration accompanies the specification] heated to a red heat and "having suitable dimensions that can be modified if necessary." In this chamber the gases and vapours of the first fraction of distillation are decomposed by heat and transformed into lighting gases, without the formation of graphite.

With regard to the gases that have a less high candle power and are given off during the second part of the distillation (the latter being thoroughly completed), their calorific effect is increased by passing them over iron oxide and nickel, with or without the addition of water gas and with the introduction of a small current of air.

To effect this the gases of the latter part of the distillation are cleaned in the usual manner, and are then supplied to an apparatus consisting of a drying oven or trough composed of two chambers—one containing iron oxide obtained by precipitating iron as iron hydrate, and subsequently calcining the hydrate; the other supplied with nickel obtained by reducing its oxide. This apparatus can be heated by a single source of heat—consisting, for instance, of the gases passing out of the flues of a gas-oven at a temperature above 300°, or consisting of generator gas.

The flue gases intended for the heating operation can be made to circulate round the walls of the apparatus (inside or outside) by passing through flues or tubes in an opposite direction to that of the gases to be cleaned and enriched. The flue gases are first made to circulate round the chambers containing the nickel, and afterwards round those containing the iron oxide. By means of valves or dampers, the

circulation of the flue gases can be regulated so as to be able to obtain the temperature required in each chamber.

The iron oxide and the nickel are arranged inside the drying chambers on trays, or are placed in ladles that are introduced into tubes in which the gases to be treated are made to pass; the gases being directed first over the iron oxide and then over the nickel.

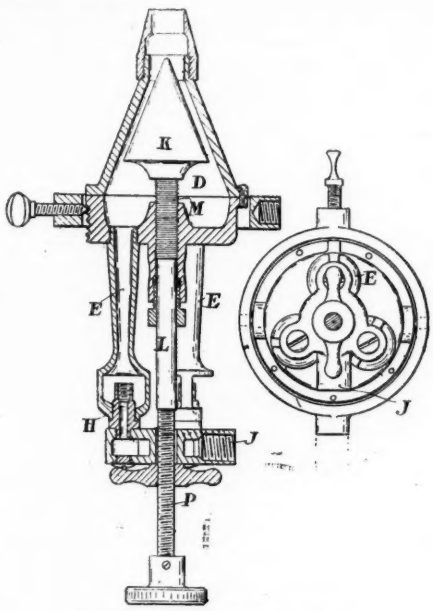
Together with the gases given off during the second fraction of the distillation of the coal, a small current of air is supplied to the apparatus in definite proportion, amounting to 0·25 to 2 per cent., so as to continually regenerate the nickel—that is to say, to remove by combustion the deposits of carbon; the air being introduced through a tap of known construction. As the gases pass from the iron oxide to the nickel, their temperature is increased, as the iron oxide is heated to a temperature of 120° C. and the nickel to about 300° C. A continuous regeneration of the nickel is thus obtained; and the latter maintains its catalytic activity without being weakened in its effect. In addition to the air, a small excess of oxygen may also, if necessary, be supplied.

Atmospheric Gas-Burners.

Tooth, L. F., of the Commercial Gas Company, Stepney.

No. 7637; March 26, 1914.

This is a modification of the invention described in patent No. 29,812 of 1910, with the object of producing a solid flame. The inventor states that he has found, in practice, that the central air tube then described is not always necessary, particularly with smaller burners, and he proposes to dispense with it, and also simplify the construction of the burner.



Tooth's Atmospheric Gas-Burner.

The illustration given of the burner shows a longitudinal sectional view, and an end view with part of the valve-operating rod removed.

The burner comprises a conical head to which is secured a base so as to form a conical mixing chamber D. Into the base are secured three or more bunsen tubes E, the lower ends of the tubes being formed with stirrups terminating in small sleeves which are adapted to receive the gas-nipples H, which are secured to a gas supply casing formed with an inlet J. Within the chamber D is a conical valve K, carried by a central operating-rod L formed with a screw-threaded part M working through a correspondingly threaded hole in the base. Below the threaded portion, the rod is formed with a reduced plain portion, below which is a further reduced screwed portion P with a fly-nut to hold the casing in position, and provided at its lower end with an operating disc.

Producing Coal Gas.

Davidson, W. B., of Birmingham.

No. 9034; April 9, 1914.

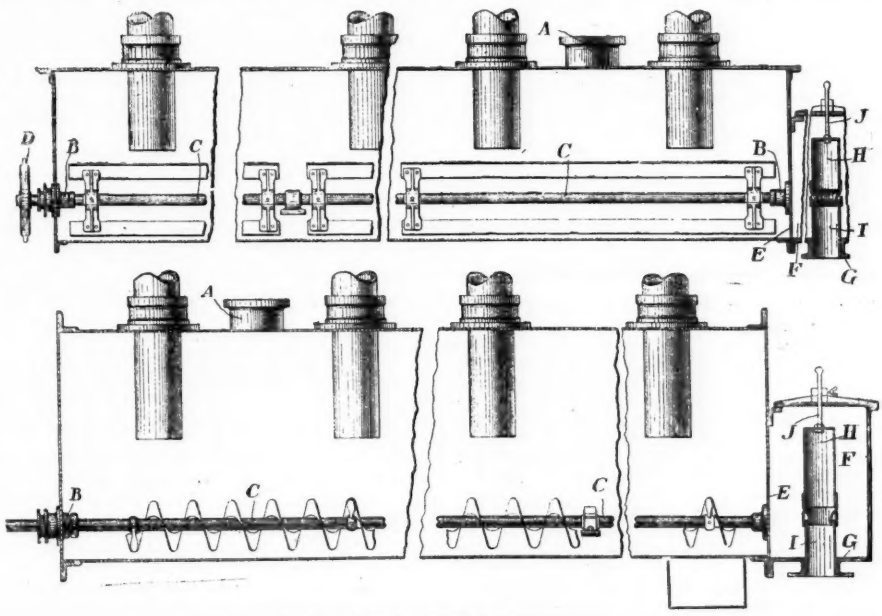
This invention relates particularly to the production of coal gas by the destructive distillation of coal, although it is applicable to other processes in which tar, pitch, and similar bye-products are produced. The objects of the invention are to prevent the accumulation of solid pitch in mains (particularly the hydraulic mains of gas plants) and "to recover pitch direct from such mains as the hot crude-gas mains in such plants as comprise vertical retorts or coke-ovens or similar plant where the hydraulic mains or equivalents are sufficiently hot."

In some cases it has been proposed, the patentee points out, to employ scrapers operated by a screwed rod or an archimedean screw device in the hydraulic main for removing solid pitch directly from the bottom of the main. He proposes to employ an agitator device in the hydraulic main, and operate it so that pitch which is delivered through the dip or take-off pipes, or which is deposited by condensation and friction from the gas, is kept continually in solution with the tar in the main, so that it may be run off.

A further feature of the invention deals with a process for producing or fractionating pitch, according to which the tar, or mixture of tar and pitch, in the main is subjected to the action of the hot gases from the retorts on surfaces which are constantly changed by the agitator, for such a period of time that, by fractional distillation by the heat of the gases, it is converted into pitch of any degree of hardness required which is fluid when at the temperature of the main but which solidifies upon being run off. In practice, it has been found that the tar is converted into pitch after it has been subjected to the action of the hot gases for about six hours, although this period may be varied considerably to suit different circumstances and conditions—such as the hardness of the pitch required. Further, tar taken from condensers or other portions of the plant is introduced into the main after running off the pitch as explained every six hours or other convenient period of time. In this connection, the specification points out that it has before been proposed to expose tar from the main in a special vessel to the action of the gas; but this was simply to remove the very light oils (such as benzol) and would be carried on at a much lower temperature.

In the construction of a portion of a hydraulic main as illustrated, an outlet pipe A is provided through which the gases pass from the hydraulic main to the condensers. In bearings B, attached to the ends of the hydraulic main, an agitator shaft C is mounted, with (if necessary) intermediate bearings. The shaft carries a series of agitator blades (preferably four in number for each series) held at each end by radial arms upon the shaft. The shaft is driven by a pulley or sprocket D or any other convenient device whereby the blades will be rotated. At one end of the main a tar outlet E is formed, communicating with a chamber F, in which is provided a valve which controls the outlet of the tar through the pipe G. This valve comprises mainly two parts—an upper cylindrical portion movable axially relatively to the stationary lower part I. The upper part is provided at its base with a conical member which, when the valve is closed, is adapted to rest upon the seating provided on the member. The upper end is provided with perforations whereby the passage of tar from the chamber F into the member H is enabled.

For operating the valve, a vertical hand rod J is provided whereby the member H may be raised or lowered in order to open or shut the valve. The lower end of the rod is preferably attached to the cylinder



Davidson's Hydraulic Main Arrangement.

by a series of spokes, the spaces between which serve as the tar inlets to the cylinder. It will be understood that when the valve is in the open position (shown at top) tar delivered to, or deposited in, the main will flow out through the opening E and through the second opening between the members H and I, so that ultimately the level of the tar in the main will correspond to the height of the seating on I from the bottom. When the valve is closed, however (as shown on p. 531), the level of the tar in the main will be raised to the height of the top of the cylinder H above the bottom.

In operation, the gas (together with impurities such as ammonia, coal tar, tar oils, and other products) as delivered to the main from the retorts passes out through the pipe A to the condensers as usual. The shaft, however, is rotated continuously, in order that any tar or pitch delivered will be constantly mixed with that already in the main, so that the accumulation of solid pitch along the bottom of the main will be prevented. "This has been found in practice to necessitate constant attention, as ordinarily it is necessary at frequent intervals to remove the solid pitch from the main."

As described, the level of the tar in the main, and therefore the length of time through which it remains there, may be varied by the valve at the end of the main, so that the tar may be subjected to the action of the hot gases entering for such a period of time that, by a process of fractional distillation, it "is converted into pitch of any degree of hardness or viscosity; this latter being preferably determined so that the pitch will be fluid when at the temperature of the main but when being poured off will become solid."

Instead of having rotating beaters there may be employed an archimedean screw, which, while rotating and agitating the tar in the main, may also be arranged to feed it towards the outlet. Any convenient form of agitator may, however, be employed—such, for example, as an oscillating blade or beater, the throw of which is variable, or the material may be agitated by gas jets, steam within limit, or the like introduced through the main into the tar under pressure.

Actuating Valves at Predetermined Times.

WRIGHT, A. C., and FROST, A. C., of Four Oaks, Warwickshire.

No. 20,553; Oct. 5, 1914.

This invention of apparatus particularly suited for automatically lighting and extinguishing gas-lamps is of the kind wherein communication between the gas-burner and the supply is controlled by a rotary valve, which is turned in a substantially instantaneous manner by the aid of mechanism controlled by the movements of a gravity-actuated or spring-urged pivoted lever, and is associated with means operating to prevent over-rotation of the valve under the impulse imparted to it by the lever, "in order that the effective full or desired opening and closing of the valve may be ensured."

The invention is described as applied to a gas-controller similar to that alluded to in patent No. 8025 of 1914; and the patentees claim: "Apparatus of the character referred to, in which the mechanism interposed between the rotary valve and the spring-urged or gravity-actuated lever is adapted, during the first portion of its return movement to its normal or inoperative position after it has been set by the lever to effect the rotation of the valve, to pass freely through space, and in the remaining portion of its return movement to knock and turn a member operatively connected with the rotary valve, whereby the latter is instantaneously turned; and means are provided on the lever for limiting, with exactness, the turning movement of the member due to the impulse imparted to it by the knock."

APPLICATIONS FOR LETTERS PATENT.

2421.—MOTTRAM, G. W., "Introducing gases into intimate contact with liquid." Feb. 16.
2469.—DUCKHAM, A. M'D., "Grading or screening material." Feb. 16.
2492.—HALL MOTOR FUEL, LTD., and TULLY, C. B., "Obtaining toluene produced in gas manufacture." Feb. 16.
2494.—ALGER, H. C., "Liquid meters." Feb. 16.
2496.—NOTT, G., "Acetylene generators." Feb. 16.
2498.—WINDEMULLER, J. H., "Gas-burners." Feb. 16.
2644.—TATE, L. J. V., "Purifier grids." Feb. 19.
2655.—KENT-JOHNSTON, A. G., "Controlling gas-lamps." Feb. 19.
2657.—FRICKER, E. H., "Silent burner jet." Feb. 19.
2735.—HALL, I., "Gas-burners." Feb. 20.
2768.—MILBOURNE, R. J., "Gas-purifiers." Feb. 20.
2769.—POOLEY, H., and FIDDES, G. B., "Washing, scrubbing, purifying, and condensing apparatus." Feb. 20.
2781.—TULLY, C. B., "Indicating and locating gas leakages." Feb. 20.

Gas and Electricity at Farnham.—The total receipts on revenue account for the year 1914 of the Farnham Gas and Electricity Company amounted to £16,853, and the payments to £12,680. Both branches of the Company's business, said the Directors in their report, have had a most satisfactory increase. The gas brought to charge this year was 66,300,300 cubic feet, as against 60,919,500 feet in the previous year; while the electricity brought to charge was 109,388 units, as against 67,927 units. To cope with this development, a new gas-holder is being erected on the Company's land at Weydon Hill; and extensions are also about to be carried out in connection with the electricity station. During the past year, a Provisional Order was obtained conferring powers to supply electricity to the Frensham Ward of the parish of Frensham, and giving facilities to raise further capital. The Directors recommended the shareholders to declare a dividend at the rate of £7 14s. per cent. (less tax) for the whole year; this being the dividend permissible under the sliding-scale clause in the Farnham Gas and Electricity Act. After deducting the interim dividend already paid, this would leave a balance of £595 to be carried forward.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Altrincham Gas, Brighton and Hove Gas, Frimley and Farnborough District Water, Ilfracombe Gas, Northwich Gas, Ormskirk Gas and Electricity, Plymouth Corporation, Prescot Gas, South Staffordshire Water, Spennymoor and Tudhoe Gas, Sutton Water, Warwick Gas, West Gloucestershire Water, Yorkshire Electric Power.

Bills committed: Ashington District Council, Sunderland Corporation (Wearmouth Bridge), Wolverhampton Corporation Water.

It has been decided that no Committees shall sit to consider opposed Private Bills till after Easter.

The War and the Suspension of the Auction Clauses.

In noticing the Bill of the Ascot District Gas and Electricity Company in the "JOURNAL" for the 5th of January, attention was called to a provision appended to the usual auction clause, to the effect that it shall not apply during a period of five years from the date of the passing of the Bill, or such longer period as the Board of Trade may sanction in writing; and the Directors of the Company are to be allowed to offer, within this period, any new capital required at such price and on such terms and conditions as they think fit. This proposed innovation results from the war conditions affecting the raising of capital; and, as Messrs. R. W. Cooper and Sons, the Agents for the Bill, have pointed out in our "Correspondence" columns, it is not to be found in any other Bill of the session. Last Thursday the Lord Chairman had under consideration the clauses of the Bill, and we understand that he reserved his decision in regard to the clause under notice. In contains an entirely new feature in gas legislation; and it will be interesting to see how his Lordship regards it, in view of present financial conditions. It may be remembered that the question of the financing of gas companies for capital purposes was first raised in the editorial columns of the "JOURNAL" for the 3rd of November last.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time and committed: Dewsbury Corporation, Doncaster Corporation, Rhondda District Council, Skegness Gas.

The Barnoldswick Water, Chelmsford Corporation Gas, Metropolitan Water Board, Skegness Gas, and Southend Water Bills have been referred to a Select Committee, consisting of Sir W. Howell Davies (Chairman), Mr. James Mason, Mr. Tyson Wilson, and Mr. Prothero; to meet on Thursday.

The following Bills have been referred to the Local Legislation Committee: Ammanford District Council, Dewsbury Corporation, Doncaster Corporation, Lincoln Corporation, Lurgan District Council, Plymouth Corporation [Lords], Rhondda District Council. The Committee will commence sitting next Tuesday, and will consider first the Doncaster Corporation Bill.

Withdrawal of the London Electric Supply Bill.

At the sitting of the House on Monday last week, the Chairman of Ways and Means (Mr. Whitley) stated that, after carefully considering the nature and scope of the powers sought in the London Electric Supply Bill, to which attention has been called in the "JOURNAL," he had informed the promoters that, in his opinion, the Bill was not one which the House ought, in the present session, to be called upon to consider, raising, as it undoubtedly did, important questions of a public character and a contentious nature. The promoters had, therefore, agreed that the order for the second reading of the Bill should be discharged, and the Bill withdrawn. He moved accordingly, and the motion was agreed to.

Railway-Borne Coal for London.

At the same sitting, Mr. William Thorne asked the President of the Board of Trade if he was aware that the Right Hon. Viscount St. Aldwyn, in his report, dated April 18, 1910, on the Port of London rates, stated that, out of 8¾ million tons of sea-borne coal, only 3½ million tons were used by the gas companies; and if he could state how many million tons were railway-borne for the year ending 1914. In reply, Mr. Runciman said he was aware of the statement referred to. The quantity of coal brought to London by rail last year had not yet been ascertained; in 1913 it was, in round figures, 8¾ million tons.

BARNOLDSWICK WATER BILL.

A Question of Locus.

COURT OF REFEREES—Thursday, Feb. 25.

(*Before Mr.* WHITLEY, *Chairman, Mr.* ERNEST MOON, K.C. (*Speaker's Counsel*), *Mr.* M'LEAN, *Sir* WILLIAM BYLES, *and Mr.* MOONEY.)

The Earby Water Company and the Kelbrook Water Company applied for *locus* to be heard against this Bill on the ground of competition; and an interesting point regarding the position of non-statutory gas and water companies was discussed.

Mr. HONORATUS LLOYD, K.C., for the Earby Company, said that at present the Barnoldswick Council supplied water in its own area under the Public Health Act; but the provisions of the Bill were now to be substituted for the provisions of the Public Health Act. A small portion of the Skipton Rural District Council separated Barnoldswick

from Earby, in which latter place a non-statutory company supplied water. As things stood at present, the Barnoldswick Council could not supply outside their area without the consent of the Local Government Board; and to this extent the Earby Company were protected against competition. By substituting the provisions of the Bill for the provisions of the Public Health Act, however, the Barnoldswick Council would be able to supply in any area, whether contiguous or not, without the slightest restriction, as clause 56 enabled the Council to enter into agreements with any local authority, company, or person for giving a supply in bulk. The position in Earby was that negotiations were actually being carried on with the local authority for taking over the Earby Company's undertaking; but if the Barnoldswick Bill went through, that Council could give a supply in bulk to the Earby Council, and enable them to compete with the Earby Company.

Mr. MOON: And the Earby Council could say to you that they would take water from Barnoldswick and compete, if you did not sell at a certain figure?

Mr. HONORATUS LLOYD said that was so. Continuing, he said he agreed that up to a certain period it was not the practice of Parliament to give *locus* on the ground of competition to a non-statutory company; but the circumstances in this case were so exceptional that he asked for discretionary *locus*, especially as in more recent times the practice had been varied somewhat. The Earby Council had particularly asked the Earby Company to undertake the supply; and it was not fair that the Company should be exposed to possible competition from a council who at present could not compete, and would now only be able to do so by abandoning the Public Health Act and obtaining a Private Act. In conclusion, he mentioned the Grangemouth and Hessle Electric Lighting Orders of 1907, when non-statutory gas companies were granted *locus*.

Mr. G. J. TALBOT, K.C., for the Barnoldswick Council, argued that Mr. Honoratus Lloyd was endeavouring to take away from the Earby Council the right which they had under section 51 of the Public Health Act, to compete with his own Company for the supply of water in Earby.

Mr. HONORATUS LLOYD reminded the Court that it was the practice of the Local Government Board not to grant loans for municipal waterworks where a company already existed, unless arrangements were made to purchase the company.

Mr. MOON said in this case, if the Earby Council purchased from Barnoldswick in bulk, they would have to go to the Local Government Board for a loan for mains.

Mr. HONORATUS LLOYD: If they wanted to avoid doing so, they could lay the mains out of the current rate, without going to the Board.

Mr. TALBOT said that clause 56, which was complained of, was the Model Clause; and all non-statutory companies commencing business knew they ran the risk of competition. They could obtain parliamentary protection by constituting themselves statutory companies. As to precedents, he maintained that, with the exception of the two mentioned by Mr. Honoratus Lloyd, the policy of the Court had been throughout uniformly to refuse to grant *locus* to non-statutory companies on the ground of competition. In the case of Hessle, *locus* was granted because the Hessle Company were actually going to Parliament that session for constitution as a statutory concern.

Mr. HONORATUS LLOYD: That did not apply to Grangemouth.

Mr. TALBOT: No; but in that case the non-statutory Company got *locus* as a ratepayer, asking for the insertion of the Northumberland clause. Continuing, he mentioned various cases to support his contention, and claimed that the principle was absolutely settled in the Brighton case of 1896. There the Brighton Corporation proposed to take over the Shoreham Water-Works Company, who also had powers to supply in Aldrington, but had not done so. A non-statutory company was actually supplying in Aldrington; and this company asked for *locus* against the Bill on the ground that it was not fair to hand over to the Brighton Corporation the competitive powers in Aldrington which the Shoreham Company had never exercised, but which the Brighton Corporation undoubtedly would. The *locus*, however, was disallowed. This, he contended, was a very much stronger case than Barnoldswick.

After some deliberation on the part of the Court,

The CHAIRMAN said: The Court has had considerable doubt about granting *locus standi* in this case. They do grant it, however, particularly in view of the fact that negotiations appear to be actually in progress between the Earby Company and the Earby Council.

Mr. SEGAR BERRY (Messrs. Sherwood and Co., Parliamentary Agents), on behalf of the Kelbrook Water Company, said his case was precisely similar to Earby, except that no negotiations were in progress with the Kelbrook Council.

The CHAIRMAN: That makes all the difference. The *locus* in this case is disallowed.

Hornsea (Yorks) Gas Company, Limited.—In moving, at the recent annual meeting of the Company, the adoption of the report and balance-sheet for the year ended Dec. 31, the Chairman (Mr. Thomas Johnson) said they might congratulate themselves on the progress made. They had an increased profit; and while the usual dividend of 7 per cent. (free of tax) was recommended, the sum of £546 would be carried to reserve. The quantity of gas made showed an increase of 13 per cent.; and on the private consumers' rental there was an increase of 14¾ per cent. This was evidence that the reduction made in the price last year had been appreciated.

Increased Demand for Gas at Romford.—It was stated in the report submitted at the recent meeting of the Romford Gas and Coke Company, Limited, that the sale of gas for the six months ended Dec. 31 showed an increase of 4·49 per cent. over the corresponding period of 1913. The revenue profit carried to profit and loss account was £3957; and sundry items brought the gross profit up to £3984. This amount, added to the balance from the previous half year, made an available total of £8225. The Directors recommended the payment of dividends for the half year at the rate of 13½ per cent. per annum on the original shares, and 10½ per cent. per annum on the "B" shares, both less income-tax. This would leave £3972 to be carried forward.

LEGAL INTELLIGENCE.

CHARGE OF INCITING TO TRADE WITH THE ENEMY.

A Prosecution Withdrawn.

Last Tuesday, before Mr. Hopkins, sitting at Bow Street Police Court, William Frederick Hendrik de Blecourt, a Dutch subject, and described as a manufacturer's agent, of Amsterdam, was charged on remand with soliciting and inciting Barach Cars, Managing Director of the Welsbach Light Company, Limited, to trade with the enemy.

Mr. BOYD (who appeared on behalf of the Assistant Director of Public Prosecutions) stated that last November the prisoner called upon Mr. Cars, and solicited orders for glassware and other goods, which he said were in the possession of several firms carrying on business in Amsterdam. He told Mr. Cars that these particular wares were manufactured in Germany or Austria; but assured him that they had been imported into Holland and paid for before the outbreak of war. He gave the names of the firms he represented, among them being Messrs. Breeser and Wolzak and Messrs. Heijbrock and Co. Mr. Cars placed an order for £650 worth of glass, on condition that he was able to get a permit to import it, and that a certificate was obtained from the British Consul at Amsterdam to the effect that the goods were not enemy goods. Subsequently the prisoner obtained a further order for Messrs. Heijbrock and Co.; and altogether four lots of goods were shipped to the Welsbach Company, accompanied in each case by a certificate from the British Consul at Amsterdam in the following terms: "I hereby certify that —— have declared before me that the merchandise designated below, which is to be shipped from this town to London, consigned to the Welsbach Company, some or all of which is of German or Austrian origin, left Germany or Austria-Hungary, as the case may be, and was bought and paid for by them before the outbreak of war; and they have produced to my satisfaction invoices, receipts, or other trustworthy documents in proof thereof." About the beginning of February the foreman of the Welsbach Company's glass stores examined the cases in which some Jena chimneys were packed, and found stamped upon them dates in September, October, and November. He knew that the practice in the factory at Jena was to stamp the cases with the date upon which the goods were packed; and it was therefore obvious that the goods had been imported into Holland after the outbreak of war, and that the Consul at Amsterdam must have been deceived. Mr. Cars thereupon communicated with the Home Office, and a search warrant was issued and executed by Inspector Ball, who took possession of a mass of documents. Blecourt answered all the Inspector's questions quite frankly. He told him that he had always relied upon the Consul's certificate, and that he had severed his connection with Messrs. Breeser and Wolzak because it had come to his knowledge that they had exhausted their supply of glass goods which were obtained before the war, and were trying to place orders for goods imported into Holland since. He declined to have anything to do with such transactions. On Feb. 14, an intimation was received at the Home Office that the accused was about to return to Holland. He was detained at Tilbury; and upon the facts then at the disposal of the authorities, it was decided that the present charge should be preferred against him. Since then it had been possible to go through the whole of the documents, with the result that nothing incriminating or in any way inconsistent with the prisoner's statements had been found. It was felt that there were substantial grounds for taking the view that he had acted in good faith, and did not know the way in which Messrs. Heijbrock and Co. intended to deal with the orders he obtained. It had therefore been decided not to proceed further with the prosecution; but, at the same time, it was not to be supposed that if people took insufficient steps to satisfy themselves of the way in which orders were carried out, their ignorance could be regarded as any defence to a charge under the Trading with the Enemy Act, in which there was ample provision to deal with cases of this kind.

The prosecution was then withdrawn, and the prisoner was released.

Sligo Gas Company and the Corporation.

The Master of the Rolls, sitting in the Chancery Division of the High Court of Justice in Ireland, has received a consent staying the action by the Sligo Gaslight Company against the Sligo Corporation and Messrs. Grainger Bros., contractors, in respect of injury to gas-mains by steam-rolling [*ante*, p. 460]. The Corporation agreed to pay all damages for injuries done, the sum to be determined by arbitration; and they also agreed to pay the costs of the Company and of Messrs. Grainger Bros.

Gas Fraud in Dublin.

Elizabeth O'Rorke was fined 40s., or, in default, ordered to be imprisoned for a month, on prosecution by the Gas Company in Dublin, at the Northern Police Court, for fraud in connection with the use of gas. It was stated that over twelve months ago a penny-in-the-slot meter was disconnected at defendant's house because of the frequent tampering with the till. It was then found that she had connected the pipes with a piece of bicycle tube, and continued using gas. The Company estimated that they had lost £15 worth of gas. It was pointed out that a similar case occurred in another district of Dublin some years ago, and that a whole family were asphyxiated as a result.

Woking Water Company.—The balance at the credit of profit and loss account is £7831, out of which the Directors of the Company recommend the payment of a dividend at the rate of 6 per cent. per annum for the past half year (less income-tax), which will absorb £4574, leaving £3257 to be carried forward.

MISCELLANEOUS NEWS.

LIVERPOOL GAS COMPANY.

Price of Gas Unaltered.

The Meeting of the Company was held last Tuesday Mr. H. WADE DEACON (the Chairman) presiding.

The report and accounts submitted, for the half year ended Dec. 31, showed that the total revenue during this period was £370,757, and the expenditure £273,273, leaving a surplus of £97,484. After deducting the amount for interest on debenture stock and mortgages, there remained a balance of £96,357, out of which the Directors recommended that a dividend be declared of 2½ per cent. on the ordinary stock of the Company for the half year.

The accounts for the past half year accompanying the report of the Directors show that the total capital paid up and added on conversion at Dec. 31 was £2,498,905, out of £3,098,905 authorized; leaving £600,000 remaining to be issued. The amount raised on loan at the same date, including premiums, was £448,718, out of the £750,222 authorized; leaving £301,503 unissued. The capital account shows that (including the amount added on conversion) £2,956,119 has been raised, and £2,107,879 spent. In the course of the half year, a sum of £15,856 was laid out for new mains and service-pipes, meters, cookers, fires, water-heaters, and parliamentary expenses. But from this total is deducted £1244 for meters condemned or destroyed; bringing the amount down to £14,612. The reserve fund stood at £125,000, and the co-partnership bonus and savings at £25,909 at the close of the half year.

The following statements relate to the working:—

Statement of Coal and Oil.

Description.	In Store June 30, 1914.	Received.	Carbonized or Used.	In Store Dec. 31, 1914.
	Tons.	Tons.	Tons.	Tons.
Common	43,329	146,894	145,563	44,660
Cannel	902	2,316	2,502	716
Total	44,231	149,210	148,065	45,376
Gas oil—gallons	79,443	2,553,373	2,278,371	354,445

Statement of Residual Products.

Description.	In Store June 30, 1914 (Estimated).	Made (Estimated).	Used in Manufacture (Estimated).	Sold.	In Store Dec. 31, 1914 (Estimated).
Coke—tons	8,792	95,877	25,590	67,678	11,401
Tar—gallons	199,249	2,172,316	3,724	2,094,073	273,768
Ammoniacal liquor—gallons	381,659	4,795,160	*Nil*	4,474,234	702,585

REVENUE ACCOUNT.

Expenditure.

	£ s. d.	£ s. d.
Manufacture of gas—		
Coals, including oil, dues, carriage, unloading, and all expenses of depositing same on works	153,511 9 0	
Purifying materials, water, and sundries	5,975 8 9	
Salaries of Engineers and Superintendents and officers at works	4,666 5 2	
Wages and gratuities at works	25,249 14 4	
Repairs and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials and labour, *less* old materials	24,895 10 7	
		214,298 7 10
Distribution of gas—		
Salaries of Surveyors, Chief Inspector, Inspectors, Assistant Inspectors, &c.	7,639 12 3	
Repair, maintenance, and renewal of mains and service pipes, including materials, laying, paving, and labour	8,605 1 10	
Repairing, renewing, & refixing meters	11,358 18 6	
,, ,, ,, fires and cookers	6,293 9 1	
		33,897 1 8
Public lamps—		
Lighting and repairing	..	938 17 9
Rates, taxes, and rents—		
Rents	..	238 6 9
Management—		
Directors' allowances	933 6 8	
Salaries of Secretary, Accountant, and clerks, office keepers, and messengers	4,752 11 0	
Collectors' commission and salaries	3,384 16 8	
Printing, stationery, and advertising	1,091 12 5	
General establishment charges and incidentals	1,551 1 1	
Shareholders' Auditors	21 0 0	
		11,734 7 10
Special charges—		
Law and Parliamentary charges	3,680 15 11	
Contributions to officials' superannuation fund	1,551 2 0	
Moiety of superannuation to old officials	1,716 8 8	
Co-partnership bonus	4,243 0 0	
Bad debts	201 1 8	
Insurances and compensations	774 4 5	
		12,166 12 6
		273,273 14 4
Balance carried to net revenue account		97,484 0 0
		370,757 14 4

Income.

	£ s. d.	£ s. d.
Sale of gas—		
Per ordinary meters at 2s. 1d. per 1000 cubic feet	192,034 18 5	
Per automatic meters at 2s. 8d. per 1000 cubic feet	85,372 10 1	
Public lighting at 1s. 10 5d. per 1000 cubic feet	13,275 17 9	
		291,683 6 3
Rental of meters	6,189 14 9	
,, fires and cookers	6,251 16 4	
		12,441 11 1
Residual products—		
Coke (*Less* expenses)	37,752 18 11	
Tar ,, ,,	15,138 9 1	
Ammoniacal liquor ,, ,,	12,521 6 1	
Other products ,, ,,	824 13 7	
		66,237 7 8
Rents		50 0 0
Fittings		345 9 4
		370,757 14 4

The CHAIRMAN, in moving the adoption of the report and accounts, said the latter were in rather a new form, owing to the fact that the Company had now a fresh Act of Parliament. On capital account the shareholders would see that £561,000 of "A" stock and £718,100 of "B" stock had been converted into £2,127,340 of ordinary stock, and there was an amount of £600,000 of ordinary stock to be issued. Debenture stock was as before—£306,083. The new Act gave the Company power to borrow £413,913; and of this a sum of £213,913 was available without the issue of further ordinary stock. The capital account was overdrawn to the extent of £106,293; and the Directors decided to borrow in order to put the matter straight. They accordingly invited shareholders to subscribe for terminable mortgages at 5 per cent. The response was quite satisfactory, and mortgages for £112,410 had been issued, some terminable in three years, some in five, and the rest in seven. As they expired, arrangements for their renewal would probably be made; or, if thought advisable, debenture stock might be issued. On capital account the additions for the six months ending December last were £14,612, chiefly for new meters and cookers, which came to £10,834. On this account there was overspent £8495. The Directors did not propose to issue further stock or mortgages at present, as they thought that they could finance themselves without any further issue. On revenue there were no comparative figures. Generally speaking, like everybody else, they had felt the effect of the war in the increased cost of production; and they had less profit from residuals. Taken altogether, however, the result was satisfactory. The total income was £370,758, and the expenditure £273,274; leaving a balance of £97,484. After paying interest and providing for dividends, a balance of £43,173 remained to be carried forward. Under the new Act the Company were entitled to carry forward each year a sum not exceeding the amount of the dividend, which at present was about £106,000. On the reserve fund account the amount stood, as it had done for many years, at £125,000—the maximum allowed under the old Act of Parliament. Under the existing Act this fund might now be increased by compound interest; and whenever the price of gas was less than 2s. 1d. per 1000 cubic feet, it might be added to by such amount out of the divisible profits as the Directors thought proper. A new reserve fund, called the "special purposes fund," available for certain specified purposes, might be created by a charge on the revenue not exceeding one-half per cent. per annum of the paid-up capital. This fund was limited in amount to one-tenth of the paid-up capital for the time being; and when formed it would add a new source of strength to the financial position of the Company. There were no other figures to which he need refer, but it was perhaps necessary that he should say a few words about the future. They had passed, like everybody else, through abnormal conditions; but they were no worse off than other people. He had no doubt they would come through in a satisfactory way. Wages were higher, and the cost of living was higher. They had increased wages, as everybody else had to do at the present time. They also made an allowance to the men who had left to join the Colours; and he was glad to say these allowances were highly appreciated by the dependants left behind. The Company had about 2000 men, and of these nearly 270 were serving with the Colours. This was a large proportion, and showed the self-sacrifice of the men employed by the Company. He might also say that one of the Directors—Mr. Edward Lawrence—had had the courage to go; and all the Directors and the shareholders wished him and the men good fortune in what lay before them. He was glad to say that the relationship between the Company and their employees continued to be exceedingly satisfactory. The co-partnership scheme helped to foster this good feeling; and since it was inaugurated £25,000 had been distributed among the employees. The Directors had carefully considered the whole question of estimates for the future, and though they had decided to leave the price of gas unaltered, if anything unforeseen should happen they would have to act accordingly. Within a few weeks two of the old officials of the Company had passed away. Mr. J. F. Robinson had been Treasurer for thirty-seven years. He did good work for the Company, and also for the gas consumers in Liverpool, because it was through his endeavours and skill that prepayment meters were first introduced into the city. Mr. P. F. Garnett, the Secretary for forty-five years, had also died, leaving behind him a record of fine work. He was glad that Mr. Garnett's son was with them that day; and he ventured to hope he would follow on the excellent lines his father had laid out. It would interest the shareholders to know that in December last the Engineer, Mr. Edward Allen, had completed fifty years of service with the Company. He had known Mr. Allen for many years, and formed a high opinion of his ability, straightforwardness, and absolute probity. The Directors, to show their personal appreciation of his ability and their esteem for him as a man, gave him a small piece of plate as a personal recognition of his worth, on the occasion of his jubilee in the service.

Mr. MORRIS seconded the motion, and it was adopted.

On the motion of Mr. WILLIAM KING, a vote of thanks was passed to the Chairman for presiding.

WANDSWORTH, WIMBLEDON, AND EPSOM DISTRICT GAS COMPANY.

The Half-Yearly Ordinary General Meeting was held last Tuesday, at the Westminster Palace Hotel, Victoria Street, S.W.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. Charles W. Braine) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

WAR CONDITIONS—CO-PARTNER LOYALTY IN A DIFFICULTY.

The CHAIRMAN, in moving the adoption of the report and accounts, said the proprietors were meeting that day under strained and unprecedented circumstances—circumstances which were very anxious for them all, and circumstances which concerned their freedom both national and individual. He might be permitted this observation—for he did not want to dwell at length on the subject—that it was a strange reflection that, after 2000 years of Christianity and 10,000 years or more of civilization, they had no better means of settling a quarrel than by 6 million of men being at each other's throats. Beside the tremendous issues that were on all their minds constantly, the smaller troubles and worries (which, however, had not been so light as usual) of a gas company's work, paled into insignificance. But they were there; and the Directors and the staff had naturally in the past six months had a period of unrest, a period of interference, and a period of difficulty in getting materials such as they had no corresponding experience of in the history of the Company. The war had taken from them something like 225 of their operatives, who went to the front like the gallant fellows they were. The proprietors would see in the revenue account a new item of £1455 for the six months (or at the rate of about £3000 a year) which they were paying to the dependants of their absent men, so that they might go away free from anxiety as to the beloved ones left behind. In this connection, they had a singular experience—one that was a gratifying testimony to the loyalty of their profit-sharers. It was strange to find, in times of such national misfortune (when one might have thought that the patriotism of every man would have been aroused), they had had to raise the wages of the men on the steamships carrying their coal no less than three times in a period of two months; and at one time the men deserted a ship absolutely because they could not have their full demands met on the spot. They were replaced by some coolies who were picked up on the coast. They also, he supposed, became subject to the influence of some union, and became discontented. The Company were in a difficulty. But their own firemen at the gas-works came to the rescue by volunteering to go aboard. They did so, and were working cheerfully and happily. This was very satisfactory. These were all men under an annual co-partnership agreement; and they were contented and delighted with their new work. The Company got their assistance at a critical time; and they were much indebted to them. He might mention that the Manager of the Wandsworth works (Mr. Croft) showed some ability in getting this work done. He (the Chairman) had also spoken as to the worries of the staff; and the proprietors could well imagine that, when one was almost at his wits' end to know whether or not a shipload of coal was going to arrive, to have pin-pricks from people who wanted more gas or coke, or who accused one of not doing this or that right, though these things might be trifling enough, added to the worry, and this was not the time their officers should be put to any trouble that could possibly be avoided.

QUESTIONS OF TRANSPORT.

Before he came to the accounts, the proprietors would naturally ask, "What is the effect of this war upon our own undertaking?" He should like to be able to treat this matter as was done by the Chairman at the meeting of the Great Northern Railway Company. He said nothing at all about the war. The railway companies, however, were in this happy position: The war authorities took them over bodily, guaranteed them their income, and relieved them of every anxiety; so that, whatever happened, railway shareholders were all right. One effect of the war on their own Company had been to limit the duty that could be performed by the ships devoted to the carrying of their coal from the North. The service of the vessels had been so largely reduced, through not being allowed to travel at all hours, especially at night, that this had hampered their efficiency to the tune of some 20 per cent. A large part of this effect fell in the half year under review; but a greater part would come in the present half year. The question was what should they do? The whole matter was one of transport. The proprietors also knew that the Company had now a very large fleet of mechanically drawn vehicles for carrying out (to meet the immense expansion of the business) stoves, fittings, services, meters, and all such-like things. Without these motor vehicles, he did not know what would happen. But the Government had threatened once or twice to commandeer them. The Company were at the present moment under a threat of this nature; but it was hoped that this would pass over. Land transport was part of their difficulty; and he dwelt upon this because it would be seen that they had transferred the value of this fleet to the capital account—it having previously been carried in the accounts as a floating balance. In view of the possibility of the war authorities commandeering the motor-waggons, the Directors thought it best to seal them down in the capital account once and for all; and the proprietors would find it there in the expenditure of the half year. Incidentally, he might say there were two or three vehicles which had previously been charged to revenue. But as this was undesirable, they had restored the expenditure to the capital account; and consequently this raised the net revenue balance.

COAL STEAMERS AND FREIGHTAGES.

Now what was the problem to be solved? How were they to escape from their principal difficulty? Coal was not scarce in the North; it was being produced there in sufficient quantity. But there was insufficient shipping to bring it to London. This was a serious matter. Then there was the action of the authorities who took steamers built to supply gas-works, and valued them at only 4s. a ton, and then later handed over to the trade a number of vessels that had been interned, but put them up to competition in the open market. The effect of this had been to put freights for coal up to a ruinous sum. Largely, this was owing to coal wanted for household purposes, which was generally to be purchased at 25s. a ton, but was now selling at 38s. The coal dealers felt, like the gas companies, that they had to get coal where they could; and so there was great competition for the ships. Their Company had to pay for a single freight 13s. 6d. per ton for what cost under 3s. by their own steamers. But he was bound to say that the contractors ultimately realized that the loss ought to be divided between them and the Company; and they reduced the charge by 5s. The whole of this matter was explained in a leaflet that had been issued by the South Metropolitan Gas Company to the consumers in their district. His colleagues and himself, however, had not thought it necessary to issue a similar statement, for the reason that two-thirds of their coal was ordinarily carried by their own steamers. Therefore, they did not suffer, except in respect of the odd fraction. The problem was what they were to do in the circumstances. The Board had been looking very anxiously for a chance of getting a steamer built, or of buying one already in existence, and having her altered to suit this particular traffic. The secret of the Company's cheap coal supply was that they ran their own vessels right up from Newcastle to their works at Wandsworth. The ordinary steamer was not fitted for this purpose. In considering the question of building another, they ascertained—this was before the war—that the cost would be some 50 per cent. more than they paid for the last one; and at the present time they would have to pay perhaps more still. But heaven only knew whether a ship could be built now, because, with the vast amount of work in hand, the yards were operating under difficulties, and materials were not easy to get; and, when the war was over, the shipbuilders would be so busy that prices were sure to be enhanced considerably. Their Engineer (Mr. H. O. Carr), who was always looking about after things of this sort, had brought them one or two offers of vessels, which were not quite suitable; but they were hoping to get one which would render them independent of the fluctuations of the market rates for freight. The proprietors would sympathize with the position. If the war were to stop next day, the Company's steamers would go on, and they could then easily charter another; and this would put an end to the difficulties. But he was afraid this was not realizable.

THE OIL POSITION.

The Company had fallen back on another system of manufacture which meant the use of American oil. He was bound to tell the proprietors that the Company had managed to keep their stocks of materials fairly well since Christmas. On inquiry, however, they found the oil-tank steamers had also been very much commandeered, and that freights in this direction were so high that the Directors could not, at the present time, settle a contract on terms that would make it worth while to do so. He thought the Directors would have to lean towards the purchase of a steamer, if they could get one to supply their deficiency.

WITHOUT EXCEPTIONAL CHARGES, THE DIVIDEND WOULD HAVE BEEN EARNED.

Coming to the report, the Directors were recommending the same dividend as last year, with a little extra upon the Wimbledon capital, due to the fact that they reduced the price of gas in that portion of their area. Under the Act which gave the Company their sliding-scale, and under the agreement, the Wimbledon proprietors were entitled, if the divisible profits allowed it, to an extra dividend, amounting to ⅛ per cent. This, of course, did not mean much in money. As to the price of gas, it was the view of the Directors that, as long as they could possibly see their way to avoid it, they should not make any increase. The price had been advanced by the Gaslight and Coke Company, the South Metropolitan Gas Company, and the South Suburban Company; and some of them had had to draw heavily on their reserves in order to pay dividends. In their own case, they had not had to draw heavily on their reserves; and they had not had to raise the price of gas. How long these halcyon conditions would remain depended on what fresh emergencies and fresh contingencies arose out of this gigantic and hideous war. Of course, they did not quite meet the dividend in December, 1913, by £5656; and at June last, they were £4226 short. But they were then working under their old coal contract—paying 1s. 3d. more per ton than they were paying now. But for the war, they would have made a surplus, instead of a loss. The proprietors would see, if they looked at the balance-sheet, how easily a surplus would have come. It would be noticed that, in addition to the profit of £26,000, they paid £1916 duty on capital (which their Auditors thought should be a capital charge); they made a war allowance to their employees' dependants of £1455; and under the stimulus the proprietors were kind enough to give the Directors at the last meeting, they made a contribution of £1000 to the Prince of Wales' Fund. This, he believed, was the largest sum given by any gas company in London—small comparatively as their undertaking was. These sums amounted to £4371; and if they had not had these exceptional charges, they would have practically cleared the dividend.

SALE OF GAS AND NEW CONNECTIONS.

Coming back to the report, the sale of gas showed the small increase of 0·8 per cent. But for the limitations caused by the war, the Directors had no doubt the increase would have been 8 per cent., instead of 0·8 per cent., because the consumers had increased in the half year by 1859, and for the year by nearly 2300. There had been a phenomenal demand for stoves, especially in the latter part of the half year. They had sent out 3112 in the half year, or an average of nearly 120 per week, which was an astonishing figure. If they had had a cold winter, he was afraid that, with the difficulty of getting raw material, the demand for gas that would have been made upon them would have placed them in a worse position. He was for once glad that they did not in the half year have the prosperity that these stoves would have brought under normal conditions, and would bring in the future. With regard to what he had said about the transport vehicles, it would have been impossible for the Company to have dealt quickly

and efficiently with the demand for heating-stoves if it had not been for their mechanical traction plant.

RECENT CAPITAL ISSUE.

In the half year, they wanted more capital. The Company owed their bankers, as he explained at the last meeting, a considerable amount of money—over £120,000. This could not go on. At the outset of the war, when the Bank rate went up to 10 per cent., the Directors found at once what a hopeless position the Company would be in unless they fell back on their own capital and paid off their bankers. The Board therefore issued £20,000 of ordinary stock, and £35,000 of debenture stock. But the prices were bad. They had to sell at a price to give £5 10s. 5d. per cent. to the buyer of the ordinary stock; while he had himself a year or two ago bought the same stock to pay him about £4 5s. per cent. The debenture stock fetched a price which would pay the buyer £4 9s. 11d. This too was bad; but it was better than remaining too much in debt. The proprietors would see by the balance-sheet that the Company were still a long way in debt; and they would have to issue more capital before long. If Mr. Richards was unable to sell it by auction, the Directors must ask the proprietors to show their patriotism, and their faith in the Company, and take up what outside people did not know the value of. All who knew that the Company were supplying gas at 1s. 9d. per 1000 cubic feet would realize that this was an exceptionally fine investment; and when the time came for the Directors to appeal to the proprietors, as they would do, to take up more capital at the same reserve price at which it was offered to the public, he hoped they would come forward and see that it was subscribed. He intended to take up his proportion, even if, to use a colloquialism, he had to "sell his shirt" to do so; for he was sure there was no better investment in the world.

NEW LAND AND PLANT.

Turning again to the capital account, the proprietors would find that land had cost the Company £5966 in the half year. On buildings and plant they had spent £930. He might mention that they had just finished two very fine retort-house extensions at Mitcham and Wandsworth, on the most modern system, which gave them a large excess of carbonizing power. These had not been fully employed this winter, owing to the war limitations. The new plant had rendered obsolete two very useful old-fashioned retort-houses and plant, which together were worth something like £14,000 to £15,000. They wrote-off one-sixth part of this amount from the half-year's revenue for wear and tear, and carried the rest, £12,400, to a suspense account. It was his duty to state that they would for the next five half years have to write-off a fifth of this £12,400. It would be easier if they went on without it in the capital account, because it would be unprofitable to use the plant in the future, in view of the better plant they now had. They would have to scrap the old plant, but not the capital with it; and that was why they must see the capital kept right. Expenditure on mains in the half year had been £3058, and on wear and tear nearly £8000, as well as £12,296 on meters, stoves, &c.—an extraordinary amount of expenditure, he thought. Owing to so many of their men having removed from the country on account of the war, and owing to the advances of the prices of materials, the Directors had rigorously cut out everything upon which they could in the half year avoid spending money. They could not, however, refuse to meet consumers' reasonable demands; and they had spent altogether about £10,000 from the revenue account and £12,300 from the capital account in giving the facilities which the public had sought from them—chiefly attracted by the fact that they were charging a low price for gas. The *pièce de résistance* of the whole capital account was the item of waggons and motors, on which £6462 had been expended in the half year. He would like to say that they had now a third vehicle which he had had some hand in directing the manufacturers to produce. It was a coke-burning quick locomotive, which was employed in the transport of their materials—coke being used instead of petrol. The proprietors had no doubt seen the National Steam Omnibuses on the streets, and knew how smoothly and steadily they ran. A paper on these omnibuses was read at the Institution of Civil Engineers; and he saw the author of the paper, and asked him why he did not try coke—seeing that coke would bring the cost down to one-thirtieth part of what petrol cost. At the *Conversazione* of the Institution of Civil Engineers, the author of the paper produced a model for using coke instead of petroleum. So the proprietors would see they had had a hand in replacing a more expensive means of traction by a cheaper method. He thought it important that the expenditure on these things should be properly recognized in the capital account, because if the War Office came to them for these motor vehicles, they could say they cost them so much, as was shown by their books. The Directors could also see that the capital value was properly depreciated and how maintained. Unless the item was fixed, crystallized, and identified with the capital, the Auditors might say that it was not in a position to be properly dealt with.

REVENUE ITEMS AND PROFIT.

As to the revenue account on repairs and maintenance of works, they had spent in the half year £1125 more than in the corresponding period of the previous year. This was partly because they had written-down a portion of the obsolete retort-houses. The working in all parts of the undertaking had been very good, except that the Company had been the victims of an unfortunate fire, through spontaneous combustion in a large coal-store; and this had reduced the output of gas over the whole period by 200 or 300 cubic feet per ton. In consideration of this, they had transferred £1950 from the special purposes fund, which was the old insurance fund. The profit of the half year was £26,415, against £28,152 for the corresponding period of the previous year, when there was no war; and the amount was arrived at after deducting £4371 for the duty on capital (which might have been a capital charge) and the contributions in connection with the war. But for these charges, they would have had £3000 more profit than they had in the corresponding half of 1913. This was an amazing result to him as an old gas man, with all the difficulties they had had; and it showed the elasticity of the undertaking. It proved that, if they sold gas cheaply enough, consumers would rally round them, and they would not lose much by the apparent sacrifice they made in the price charged. In the balance-sheet rather a large figure appeared under the head of stores. He did not like this, as the amount was about £12,000 or £13,000 more than at the corresponding period of the previous year. He had, however, inquired into the matter with their Engineer, and had verified the fact that the mains represented were in stock. They had not, however, been able to get them laid; but they would proceed to lay them in due course, and when laid, inexpensively in the period in front of them, he trusted that they would conduce to the extension of the business. The proprietors were much to be congratulated on being able, at a time when the price of the gas had not been raised, to receive their full dividends, and upon the fact that they had earned within £1500 of the amount earned a year ago.

The DEPUTY-CHAIRMAN (Mr. R. Garraway Rice) seconded the motion.

Mr. GEORGE ENNIS thought the proprietors had reason to congratulate themselves upon the accounts. The only two items he wished to refer to were the £98,000 debt to the bankers and the £12,000 standing at the suspense account. The Chairman suggested that the suspense account should be dealt with in the course of years. He never liked suspense accounts; and he hoped the Board would be able to contemplate the extinction of this account before long. With regard to the bankers' loan, he suggested that the Directors should raise the price of gas to the consumers. They would have nothing to complain of. Supposing the price was put up 3d., it would still be very cheap, and its use would not be diminished one bit. It was very important the Company should have a less heavy debt.

The CHAIRMAN said Mr. Ennis had pointed to two serious matters, and to the dangerous position the Company would be in if there was another war crisis, and gold became scarce in the country, and the Bank rate went up again to 10 per cent. Mr. Ennis also touched upon another matter, and that was the reserve the Company possessed with which to meet the further charges which were arising rather thickly around them. He should be sorry to make a speech that was too sanguine and encouraging, because it was a fact they were in seriously anxious times. What, however, was their position. He had always held that the best reserve in the world was the low price they charged. Mr. Ennis struck a true statesmanlike note when he said that the low price of gas gave the Company a capacity for raising the price to meet an emergency without inflicting a hardship on the consumers. What they might have to do in regard to the price, he (the Chairman) did not know. The difficulty would be to determine exactly what should be the price to which they should go. He should feel himself in a ridiculous position if the price were only raised 2d. when they wanted 6d. But before raising the price, they might draw to some extent on their reserve funds, which they had not touched yet. The wider reserve fund in the low price was a very valuable asset; and it was one of the grand features of the sliding-scale that it brought the consumers and the proprietors into partnership in this matter. Mentioning that he was a pioneer in 1875 in connection with the Commercial Gas Company in adopting the sliding-scale proposed by Sir George Livesey, he added as a point of interest that as early as 1864 he had a sliding-scale clause put into the Watford Gas Company's Act.

The motion was unanimously carried.

Moved by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, dividends were declared at the statutory rates as follows: On the Wandsworth "A" stock, £8 7s. 6d.; on the Wandsworth "B" stock, £6 17s. 6d.; on the Wandsworth "C" stock, £5 17s. 3d.; on the Wimbledon stock, £6 5s.; on the Epsom stock, £6 17s. 6d.; and on the new ordinary stock, £5 17s. 3d. per cent. per annum.

The CHAIRMAN explained that on the last occasion, under their new Act of Parliament, five Directors went out of office, and were re-elected; and it was really only necessary that they should re-elect one on this occasion—Dr. T. A. Ives Howell. But, in order to regularize the retirements as early as possible, Mr. G. F. Page and himself also retired on this occasion, and offered themselves for re-election.

Proposed by the DEPUTY-CHAIRMAN, and seconded by Mr. W. HENNELL, the Chairman, Dr. T. A. Ives Howell, and Mr. G. F. Page were then re-elected to their seats at the Board.

Mr. ENNIS moved, and Mr. L. ANDREWS seconded, the reappointment of Mr. H. Willis Smith as Auditor.

Mr. C. E. NUTTALL, J.P., proposed a cordial vote of thanks to the Chairman and Directors; and, in doing so, said that as one having a substantial interest in a great many companies round about, and being Chairman of a neighbouring Company, he could feelingly sympathize with the Chairman and Directors in the troubles and anxieties they must have experienced the last few months in regard to freights and other expenses demanded in carrying on the business. Of course, the Company had a great advantage over some of the other southern companies through having a water-way and their own ships. The companies situated away from the river had experienced greater difficulties perhaps than those situated on it. In the Company of which he was Chairman, they had had great difficulty in getting trucks along the railways, and freightage had been high; while it had been very hard to get even the quantity of coal they wanted, although paying high prices for it. They had had to be content to obtain coal from hand to mouth, and to get along as best they could.

Mr. ANDREWS seconded the motion, which was heartily carried.

The CHAIRMAN, in responding, took the opportunity of acknowledging the re-election of his two retiring colleagues and himself. He then proceeded to speak of the work of their two chief officers—Mr. Carr and Mr. Braine—and of their "subalterns" and of the workmen, and asked the proprietors to extend to them all their appreciation, for the half year had been a strenuous one for them.

Mr. HOWES seconded the motion; and it was heartily passed.

Both Mr. BRAINE and Mr. CARR replied on behalf of their staffs, the men, and themselves.

The CHAIRMAN mentioned that the Board were occasionally asked, in addition to the subscriptions made by the Company at the beginning of the war, for contributions to various societies associated with the war. In their district there were nursing and refugees homes and other establishments to which they were giving allowances on gas, coke, and other things; and he asked for an endorsement to this action.

This was readily given; and the proceedings then terminated.

CROYDON GAS COMPANY.

The Half-Yearly General Meeting of the Company was held last Friday, at the Offices, Katharine Street, Croydon—Mr. CHARLES HUSSEY, J.P., in the chair.

The SECRETARY (Mr. W. W. Topley) read the notice convening the meeting. The Directors' report and the accounts were taken as read.

THE EFFECTS OF THE WAR.

The CHAIRMAN, in moving the adoption of the report and accounts, said, in approaching the subject of the Company's affairs during the past half year, it was difficult—well-nigh impossible—to keep one's mind from straying to the consideration of the vast issues with which they, in common with all parts of national life, had been interwoven. Whether in retrospect or in outlook, they found their minds overshadowed by the course of world-wide movements which, confidently as they might and did anticipate their outcome, were affecting, at almost every point, the Company's operations and results. Needless to say, their immediate effect on the working and the profits was an unfavourable one. He hoped, however, to satisfy the proprietors that a closer examination would disclose no grounds for uneasiness so far as the Company were concerned, but would rather show the inherent vitality of the gas industry, and the position that it had attained and was strengthening as one essential to the comfort of the homes of the community and the maintenance of the country's industrial life. Certainly, measured by output, if the curtailment of street lighting, the darkening of shop windows, and the earlier closing of public houses were borne in mind, it was satisfactory to find that they could record an increase—a very small one it was true, but still an increase—on the corresponding period of last year. But for the war, this increase would undoubtedly have been a very large one. As it was, they compared not unfavourably with many of their neighbours; and they might, he thought, confidently anticipate that when—be it soon or late, they all hoped soon—this devastating war had ended, and their national life had resumed its normal course, they would again enter upon a period of progress both steady and rapid, perhaps the more rapid that its course was now, unhappily, temporarily checked.

INCREASED DEMAND FOR HEATING APPLIANCES.

As throwing light upon this point, it was interesting to note the little effect the war had produced on the growth of the number of gas appliances connected. He found that during the past six years the number of gas fires and cookers supplied on hire had risen from 21,500 to 43,200, or more than double. To this might be added upwards of 4000 sold outright during the same period. This represented an average annual increase of, in round numbers, 4300. During the last twelve months, the increase had been 5116; and of this number the last half year, notwithstanding the disturbances of the war, had contributed 3025. He need hardly say, however, that not only the Directors, but those who under them carried on the daily business of the Company, had had, were having, and expected still to experience, difficult and anxious times. A tendency to diminished consumption, if only temporary, was disquieting in its immediate effect upon profits; and in the current half year they were feeling the effects of the war more fully than in the six months to December.

COAL, FREIGHTS, AND CARBURETTED WATER GAS.

The most pressing cause for anxiety, however, was the question of supplies of coal, and to a lesser degree (though this in itself was serious enough) the high prices they had to pay to secure supplies at all. Most of the proprietors knew something of the situation created in regard to shipments by the very large reduction in available tonnage, caused mainly by the requirements of the Government, and of the difficulties and delays in rail transit due in part to the number of railway trucks which were in use for war purposes, and in part to the frequent congestion of the lines, resulting in great delays in transit. In normal times, the freight for coal from the Tyne to London was about 3s. per ton. Recently rates as high as 13s. 6d. had been demanded; and though some measure of relief had been obtained as a result of the release of interned enemy vessels for this purpose (a relief for which he believed the public services of London had in large measure to thank their esteemed colleague, Sir Corbet Woodall), the shippers had to pay freights of about 11s. per ton. Now 1s. on the cost of coal was equivalent to about 1d. per 1000 cubic feet of gas; so the advance in freights meant about 8d. per 1000 cubic feet. It was true the Company had not had to bear the whole of this burden. But much of the coal gas recently made had cost them for coal 5d. per 1000 cubic feet more than it would have done had they been able to obtain in the normal way the coal for which they had contracts. To meet the situation, the make of carburetted water gas had been largely increased. Fortunately the Directors were able recently to effect a considerable purchase of oil at reasonable prices; but since the purchase was made, oil had materially advanced in price. The true economy of water-gas plant, however, was experienced when it was so used as (by taking up the daily fluctuations of demand) to enable the manufacture of coal gas to be carried on under the most favourable conditions. When, as was now the case, it was found necessary to use the water-gas plant for the purpose primarily of conserving the coal resources, it was impossible for their Engineer to work to the best advantage from an economical point of view. The result was seen in the accounts by a reference to the cost of coal and oil on the one side, and the return from residuals on the other. As compared with a year ago, the cost of gas "into the holder" had been higher by rather more than 2½d. per 1000 cubic feet, and at the present moment this disparity was probably greater rather than less.

ADVANCES IN THE PRICE OF GAS.

Three years ago the Directors had much pleasure in reducing the price of gas in Croydon from 2s. 6d. to 2s. 5d. Since that time, the net cost of manufacture had risen by 5⅝d. per 1000 cubic feet, or equal to more than £34,000 a year. There would be no surprise, he thought, on the part of the proprietors or the consumers, that the Directors should feel that a portion of this burden must be shared by the consumers. Therefore, although most reluctantly, the price of gas was increased by 1d. per 1000 cubic feet as from October. Many of their neighbours found it necessary to add 2d. to their price. In their own case, the consumers had so far been called upon to bear only £6000 out of a burden of £34,000. The last thing the Directors wished to do was to further raise the price; but he was bound to say that, if the expenses the Company had to bear should increase, and possibly if they only continued as now, another advance in the near future might become inevitable. In fact, the Directors had had the matter under consideration that day; and it was almost certain another advance would be announced. What he had said would, he thought, satisfy the proprietors and the consumers that should such an increase have to be made, it would only be under the pressure of urgent necessity.

CAPITAL ISSUES.

The proprietors would have seen that the Directors had found it necessary to raise further capital by two issues of "D" stock, which, under the conditions ruling in the Money Market, realized prices with which they had every reason to be satisfied. A further £25,000 would shortly be offered by tender; the Treasury's consent having been obtained.

NEW GASHOLDER AND SHOW-ROOMS.

The new gasholder, with which some progress had now been made, would with the tank (which had been finished) cost about £60,000; and there was, in addition, a constant necessity for the expenditure of capital on the distribution side, to meet the requirements of the consumers by laying mains and providing meters, stoves, and other appliances. The proprietors might rest assured that the Directors were not unmindful of the need for restricting expenditure on capital account as far as was consistent with adequate provision for the Company's needs. The new show-room and district offices at Norbury were now complete; and their opening to the public only awaited the making-up by the Corporation of a strip of frontage which had been given up in order to provide an improved approach to the premises. The convenience of this show-room and office would, he felt sure, be appreciated by the consumers in the district, which was a rapidly growing one.

FROM THE ACCOUNTS.

Treating the accounts in somewhat more detail, it would be seen that there was a saving on the cost of coal and oil of about £4000, against which had to be set a lessened revenue from residuals of £8000. Tar showed a considerable decrease; and, unfortunately, there seemed little or no prospect for some time to come of a more favourable return from this source. Nearly two-thirds of tar was, after distillation, represented by pitch; and this product was at present almost unsaleable—its chief outlet (briquette making in Belgium and France) being practically closed, to say nothing of the difficulty and expense of shipment. Being a solid product, the storage of pitch presented no great difficulty; and ultimately they might hope for its realization on less unfavourable terms than would be possible now. Sulphate of ammonia also yielded a decreased revenue. This was mainly due to the decreased production; for prices, though low last summer, had lately shown a marked improvement. Only that day, he might say, they had sold some at a better price than they had realized for some time past. Here, in fact, they had almost the only favourable effect the war had produced on their finances. Last year the price of sulphate fell to a lower level than for many years before; and apprehensions of even worse prices were felt. This was due in part to production tending to increase more rapidly than demand, and in part to the introduction in Germany of a means of direct production from the atmosphere. Now the German competition was eliminated; and, with a general tendency to lessened production, the balance of price was turning in favour of the producer. He should not omit mention of the useful work now being done by the Sulphate of Ammonia Association, in educating farmers as to the value of sulphate as a manure, in the information they gave to producers as to market prices, and in the help which they afforded where necessary in obtaining a fair market value for the sulphate made.

STREET AND SHOP LIGHTING.

There had been an increase of expenditure and a decrease of revenue under the head of public lighting. The Company had now, under arrangements with the eight lighting authorities in their district, substituted improved inverted incandescent burners for the upright burners previously in use. By this means, the public got a better light at a much lower cost; and the cost of conversion was spread over a period of years so that an immediate present, and a larger future, saving was effected by the ratepayers. Incidentally, the conversion had necessitated the renewal of a number of lanterns earlier than would otherwise have been necessary; and this expense, borne out of revenue now, would be largely recouped by a saving in future years. The reduction of street and shop lighting necessitated by the regulations made under the Defence of the Realm Act had raised the question of what should be the payments under contracts at fixed inclusive rates covering labour and materials as well as gas supplied. In this somewhat difficult matter, the Company had met their customers—both the local authorities and the shopkeepers—in a way which had, he believed, been regarded as generous, and had given very general satisfaction.

WITH THE FORCES—ON THE ROLL OF HONOUR.

He referred in August last to the number of employees serving with His Majesty's Forces; and what he then said as to the assistance the Company were giving to the dependants of the men, he thought, met with the full approval of the shareholders. They had now upwards of 120 men serving their country afloat and ashore; and the cost to the Company of the allowances granted was at the rate of about £1700 per annum. A further provision for special cases of hardship was made which did not appear in the accounts—namely, a fund to which the Directors, officers, and other employees (he believed without exception) were contributing. This amounted at present to about £700 per annum. A portion of the proceeds was given to the Prince of Wales fund; the remainder being retained to meet any exceptional needs which might arise among the Company's own employees. The war service of the employees had not, he was sorry to say, been without its cost in valuable lives. Many would recall their caretaker, H. Hobbs, who gave his life for his country serving on H.M.S. *Cressy*, to which he was appointed as leading signalman on the outbreak

of the war. More recently, H. Heath, the Company's senior motor driver, died while engaged on transport service in France. Both were highly esteemed and well liked by their fellows. Their services were valued by the Company; and they mourned their loss while they respected their memories.

THE CARRY-FORWARD.

In conclusion, he mentioned that the payment of the dividends, while reducing the balance of profit to be carried forward by £8584, would leave in hand the sum of £10,347.

The DEPUTY-CHAIRMAN (Mr. Thomas Rigby), in seconding, said he had nothing to add to the Chairman's statements. He had told the proprietors that the half year had been a very difficult and anxious one; and he (Mr. Rigby) entirely agreed with this. But he had every confidence in the future of the Company.

SIR CORBET WOODALL ON AN UNPATRIOTIC ACTION.

Sir CORBET WOODALL moved the declaration of dividends (all less income-tax) at the rates per annum of 15 per cent. on the "A" stock, 12 per cent. on the "B" and "C" stocks, 5 per cent. on the "D" stock, and 10 per cent. on the "E" stock. In doing so, he remarked that after the statement by the Chairman, and with the accounts before them, it was quite possible some of the proprietors might question the wisdom of the resolution. One never liked to divide that which had not been earned in the period for which the division took place. But they had, as the Chairman had pointed out, a considerable reserve in the shape of the carry-forward which had been accumulated in half years that were less trying than the past one had been; £10,000 was the half of still another dividend. In addition, they had some £40,000 in the reserve fund, and £16,000 in the insurance fund; so that their financial position was not by any means a weak one. But he thought the Directors would have failed in their duty to the proprietors if they had not pointed out, as had been done in the Chairman's address, that the outlook for the immediate future was not a bright one. The condition of things with regard both to the demand for the gas they supplied and to the procuring of materials necessary for its manufacture were extremely perplexing and difficult to forecast, as they all centred round the prevalence of war; and this war looked as though, like Tennyson's brook, it might be going on for ever. But naturally this could not be; and it might be quite possible that it would spend itself earlier than some of them at present anticipated. So long, however, as the war did continue, the conditions of gas manufacture would be extremely difficult. He thought they would all subscribe to the proposition that it was an unpatriotic thing to make special war profits during the time of the prevalence of the war. But while most people would subscribe to this as a proposition, there were a great many who failed to live up to it when the temptation came in their way. And consequently they found that the value of materials which had to be bought by the community, as well as by themselves, had risen far beyond what was necessary. As affecting the Company, the cost of coal and the price they were paying for the freight of steamers were cases in point. The extra cost of bringing coal to London and the neighbourhood was certainly not more than 1s. 6d. or 2s. per ton. Yet they found the freights for steamers had gone up from 3s. to 13s. to 17s.—the latter price was paid for a ship on one day that very week. This was utterly unjustified by any reason arising out of cost. But even the Government appeared to have been unable to resist the temptation to make a profit where it was open to them. Although the Government only paid for the vast fleet of ships which they quite properly commandeered at the opening of the war—a fleet consisting of some 2000 steamers and colliers—a freight representing only 4s. per ton carried, they themselves were now asking for enemy ships which they had released 12s. per ton. Explanation or justification for such action he failed absolutely to see. The course taken by the Government was doubly injurious, because it endorsed with their approval the price charged by the shipowners. This, with the increase in the cost of coal, did darken the immediate outlook. He agreed with Mr. Rigby's remark that these trying circumstances were of to-day. They were ephemeral; and they would pass. The general condition of the Company was sound and, to his mind, very hopeful indeed; and, as soon as the war was over, they would return to the normal conditions of prosperity which had attended the Company for so many years past. They had all to remember that the country was at war for principles which called for the sacrifice of anything and everything, in order that it might be brought to a successful issue. Therefore if they as stockholders and their consumers had to bear some loss, he did not think there would be much disposition to cry out. That the country and their Allies were to win was a point upon which all were determined; and they must pay the price. With this confidence in the future, he thought they were doing wisely that day, when they had the reserves to which he had referred, and their position was so strong financially, to pay the dividends to which the proprietors were entitled. It was a period when everybody was taxed and tried heavily; and so long as the Company could help to meet these heavy burdens, he thought it was their duty to do so. Whether there might be an interruption to this of more or less severity in the near future, was a matter that could not be forecast that day.

Mr. PERCY H. HALL, J.P., seconded the motion, which was unanimously carried.

Moved by the DEPUTY-CHAIRMAN, and seconded by Mr. HALL, Mr. William Cash (who was unavoidably absent) was re-elected to his seat at the Board.

Proposed by Mr. SAMUEL SPENCER, and seconded by Mr. W. J. RUSSELL, Mr. Hall was also re-elected.

The CHAIRMAN next proposed the re-election of Mr. Russell, mentioning that he had served the Company well for a great many years as Secretary and since as a member of the Board. His experience as Secretary was of valuable assistance to the Board.

The DEPUTY-CHAIRMAN seconded the motion, which was heartily passed.

Mr. RUSSELL, in the course of his acknowledgment, mentioned that he had served the Company now for 52 years.

Mr. HALL also thanked the proprietors for his re-election.

Moved by Mr. J. T. MAITLAND, and seconded by Mr. A. R. HARWOOD, the retiring Auditor (Mr. John Jones) was re-appointed.

Mr. CHARLES WEBB moved a vote of thanks to the Chairman and Directors. He remarked that they all knew the qualities of their Directors. They were experts in gas administration; and the proprietors would have to go a long way to find their equal. His advice to the stockholders was to keep the stock they had in the Company. They could not better it as an investment. He had studied gas undertakings now for upwards of forty years; and with the first five pound note he saved up, he bought gas stock. Gas had become a necessity; and yet, in his opinion, its use was still in its infancy. They heard talk of lighting, heating, and cooking by electricity; but gas companies did not cater for the few, they catered for the many. The "many" were the backbone of gas concerns. These were anxious times; but the Directors, as the proprietors' trustees, were looking after their interests, and he was sure, under their administration, the Company would come well out of these times.

Dr. CRITCHLEY, in seconding, said in view of the strenuous times through which they were passing, it would require all the ingenuity and acuity of the Directors and their officers to keep up the dividends. He was glad to hear that the Board had exercised their prerogative of increasing the price of gas, and that they were going to do so again. Neither the proprietors nor the consumers would find fault with this, in view of the conditions with which the Company were faced in regard to raw materials.

The motion was cordially agreed to.

A WAR BONUS FOR THE MEN.

The CHAIRMAN, on behalf of his colleagues and himself, thanked Mr. Webb for his generous remarks, and the proprietors for their cordial endorsement. Mr. Webb had advised the proprietors to stick to their stock; but he (the Chairman) was going to ask the proprietors not only to stick to their stock, but to buy more from that which the Directors were about to issue. He felt sure they would not regret it, because they would probably get their dividends as regularly in the future as in the past. The past six months had been very trying and worrying ones. While the difficulties and anxieties would not be lessened for some time to come, the Board had no anxiety as to the dividend, for, as Sir Corbet Woodall had just said, their concern was financially strong. They did not know what was going to happen in regard to coal and oil; but he had no doubt they would be able to keep Croydon going with gas for lighting, cooking, and heating. For 22 or 23 years, he had had the pleasure of proposing a vote of thanks to their officers, their staffs, and the workmen. On this occasion, he could only reiterate, but with greater emphasis, what he had said in the past as to their services. Of Mr. Caddick, the excellent Engineer and Manager of their works, of Mr. Topley, their energetic and valuable Secretary, of Mr. Sandeman, who managed the distribution department, of Mr. Anderson, the Assistant Secretary, and of Mr. Haines, the head of the rental department, he could only say that their work had been throughout these troublous times unremitting in the interests of the Company. During the half year, they had lost the services of 120 men who had gone to the front, and they could not have such depletion without throwing greater responsibility upon those who were left behind. But all—from the highest to the lowest—had responded with the utmost cordiality, and had put their hearts into the work. There was one point he should like to specially mention. Although the Company were paying a proper wage to their men before the war commenced, they knew that the price of food had increased enormously during the war; and it might possibly be even higher still. Therefore, the Directors had favourably regarded an application from the men for some further consideration; and he was sure the stockholders would say they had done the right thing. What was proposed was to give the men a bonus of so much per week during the war, or during the period of the extra cost of food brought about by the war, and on the same lines as the Croydon Corporation the previous evening resolved upon—that was, increase the wages by from 1s. to 3s. a week according to the rates of wages earned. The Directors believed the request of the men was a reasonable one, and so had granted it—knowing that they would be backed by the stockholders.

Mr. SAMUEL SPENCER seconded the resolution.

Mr. A. CADDICK (the Engineer and Works Manager), in thanking the proprietors on behalf of his staff, men, and himself, said he could not say too much in praise of those who had been daily associated with him in these difficult times.

Mr. W. W. TOPLEY (the Secretary), in replying for all in his department, said he too should like to take the opportunity of expressing his personal indebtedness to those who assisted in the work for which he was responsible for the way they had responded to the call for increased efforts.

Mr. W. J. SANDEMAN (the Distributing Engineer and Sales Manager) spoke of the encouragement the kind words of the Chairman and the vote of the proprietors would give to all in his department. Regarding the past half year, he said that the volume of business dealt with by the distribution department had been greater than ever; and he was sure that, had it not been for the lighting restrictions, the Company would have had a record output of gas.

Brynmawr and Blaina Gas Company.—Mr. Alfred Weeks presided over the annual meeting of the Company in the absence of the Chairman (Mr. J. G. Bishop), who is serving with the military forces. It was reported that during the year there had been an increase in the revenue of approximately £500. There had been a profit made on the working of £1678. The Directors recommended that a dividend of 5 per cent. (less income-tax) be paid on the preference stock, and 5 per cent. (free of income-tax) on the ordinary stock. They considered it very satisfactory that there had been an increase of revenue, notwithstanding the slump experienced during the year in the residual market. The recommendations were adopted. Mr. Evan Rees, who was for some years Manager, is now at Margam; and the shareholders at this meeting expressed satisfaction at the way the work had been carried on by the new Manager (Mr. Leonard Murray). The leakage account had been reduced from 18 to 12 per cent., and this was regarded as a matter for congratulation.

BOURNEMOUTH GAS AND WATER COMPANY.

Military Operations and Concentrations and the Half-Year's Business.

The Ordinary General Meeting of the Company was held last Friday, at the London Offices, No. 90, Cannon Street, E.C.—Mr. G. CRISPE WHITELEY in the chair.

The SECRETARY (Mr. H. A. Plumb) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN said he had very much pleasure in proposing that the report and accounts be received, adopted, and entered on the minutes. At the last half-yearly meeting, the country was on the threshold of a great war. They then knew not what a moment would bring forth, and "feared as they entered into the cloud." All were anxious and ready to make sacrifices; all were eager to do something. He had now to deal with six months of that period; and the proprietors would, he knew, like him to state shortly what was the result. With regard to their duty to the country, they had sent out their Chief Engineer and General Manager. He hoped the proprietors would recognize him in Major Woodall. He had gone with 140 of the Company's men who had joined His Majesty's forces. Glad, too, was he (the Chairman) to say that two of their Assistant Engineers had gained commissions, and were now doing their duty. Those assembled at the meeting could not do better than wish them all "God speed," and trust to a safe return. Following the proprietors' instruction, the Board had dealt (he hoped) liberally with everybody; and they would continue to do so. Here he should like at once to pay a tribute to the whole of the staff for being loyal both to country and Company. Every employee had joined the Company's war fund. This was the fund which, it would be remembered, was got together to help to pay for those who went out, and to those whom they left at home. At the present time, they were paying at the rate of £2326 a year in connection with this fund; and he was pleased to say all were joining (from the Directors downwards) in the sacrifices that were being made. He did not think that any of them knew at the time of the last meeting that Major Woodall was going to set such a good example to the rest of the staff. But he (the Chairman) need not say that he did not think their Engineer and General Manager would have proposed to go, and certainly the Board would have had great hesitancy in permitting him to go, if he and they had not felt sure that the staff was in such a condition as to be able to carry on the work, and to do so successfully and well in the absence of their chief. They had now Mr. Moon as their Acting Engineer and General Manager. He had now been with the Company nine years; and the Directors had the strongest confidence that he could carry on the work, and that he would do so efficiently and well. It was not the ordinary work of the Company. The six months Mr. Moon had already had, and even more so, the time that was before him had been and would be periods of great stress and considerable anxiety. He (the Chairman) had asked him to describe the half-year's work; and he replied: "It has been a continuous struggle, in one form or another, against the disabilities arising from the war." Yet there were few who were present at the last half-yearly meeting who would have prophesied boldly—they might have prophesied, but he doubted if they would have done it very boldly—that he (the Chairman) would have been here at the end of the six months presenting a balance-sheet as satisfactory as, and even more satisfactory in many ways than, the last one; that he would be proposing the statutory and usual dividends; and that he would be able to say that these dividends were not only justified by the accounts, but were justified as having been earned during the six months with which they were dealing. Of course, they had to report as he had done before—in fact, it was getting commonplace now—a sustained and combined increase throughout the whole of their district. The great trouble had been with regard to coal and oil. He could take up a considerable portion of the proprietors' time, and could provide a very long—in some ways serious, in some ways amusing—pamphlet for the proprietors to read regarding coal and oil. He did not, however, consider it would be wise to say too much about how they had been doing it, and how they were going to do it. They had now to do a great deal quietly, following the example of the military authorities; and he did not think it would be at all wise to announce too publicly how they did these things. However, he did congratulate the proprietors on the fact that, during the whole of the six months, they had—true, with difficulty—maintained their supplies. On the good side, they had had 20,000 troops billeted in their district; they had had many hospitals started both in Bournemouth and Poole; and they had accommodation for 2000 wounded Indians provided at Barton Court. It was interesting to note that this camp of Indians came into their new district almost, he might say, at the right time—when they were just ready to receive them. In all these hospitals and for all the troops, the lighting, heating, and cooking had been done by gas. On the other side, there had been the decrease in the lighting at night, and the absence of visitors for the autumn season. Fortunately, Bournemouth had got a season all the year round; and this had helped the Company, and would help them in the future. There was no doubt the Company did lose considerably by the absence of the usual autumn season and visitors. However, the result was most gratifying. The additions caused by the troops went to more than balance the decrease of the lighting and the absence of visitors, and gave a most satisfying increase. The old Bourne Valley works had been handed over almost entirely to the military authorities; and he might say at once that this had been much appreciated by the latter. They had two companies of engineers quartered there; and the works were their headquarters. The old retort-houses and the coal-stores had been used for drilling purposes in the wet weather; and had been found a considerable comfort and of great use. To those who liked records, he might say that they had reached the record of 1000 million cubic feet sold for 1914. Comparing this with sixteen years ago—1899—when 280 million cubic feet were sold, it was seen what a marvellous increase there had been in the Company's work. He had spoken very highly of the staff, and he could not speak too highly of the way they had supported the Board. Something was also due to the Company's customers who had paid up, he must say, wonderfully well. The proprietors would see, on examining the accounts, that there was not much of which to complain in that respect. He hoped this would continue. He had said the dividends were not only justifiable, but that they had been earned during the six months. It would be noted that the carry-forward was £8800 less than it was a year ago; but, on the other side, they had written off during the past twelve months more than £10,000—for works displaced, £7000; compensations for leaseholds, £2000; and compensations to the officials of the old Christchurch Company, £1790. So they had positively a balance in hand; and they might fairly be said to have earned their dividends for not only the six months but the year. He had never been in the habit of talking much about the future. If there ever was a time when one would hesitate to do so, it was the present. Nobody knew, or could know, what was going to happen. All he could say was that the Board had done their best in the past; and as they had been supported by the proprietors in the past, so they might ask them to trust the Board to do their best in the future. Old legal contracts always used to provide against the acts of God and the King's enemies. The acts of God were in other hands, and consequently could not be dealt with. The acts of the King's enemies they were going to do their best to fight against, and to conquer. In their way, they would have to take their share. They might be blown up at any moment, or they might successfully get through. But they would continue quietly, and he hoped surely, to do their business; and the Directors would trust to receiving the satisfaction and the support of the proprietors, and of the inhabitants of Bournemouth and the surrounding district, in providing good gas and pure water, which it had been their delight to provide in the past.

Sir CORBET WOODALL, in seconding the resolution, said he should not attempt to distract the attention of the proprietors from the delightful and informative speech the Chairman had delivered. He could only repeat what the Chairman had said—that it was extremely satisfactory at a time like this to have a report such as the Directors had presented to the proprietors, showing undiminished profits to divide. The dividends had been earned in the half year, as the Chairman had told them; but he shared his feeling very strongly that it was unwise to enter into the region of prophecy, until they knew more than they did at the present. There was no question whatever that they were in times of extreme difficulty, which required most strenuous care and watchfulness; and it was impossible to say what even the current half year would bring forth. All he could say was that he shared the Chairman's confidence that what could be done to maintain the status and the success of the Company, the staff (with the Board supporting them) would not be found wanting in doing.

The motion was unanimously carried.

The CHAIRMAN proposed the declaration of dividends (all less income-tax) at the following rates per annum: 16 per cent. on the original shares, 7 per cent. on the "B" ordinary shares, and 6 per cent. on the preference shares.

Mr. WILLIAM CASH, F.C.A., seconded the motion, which was carried unanimously.

The CHAIRMAN remarked that only recently they elected Sir Charles Jessel, Bart., to their Board. He had justified all the ideas the Board entertained in asking him to join them; and a more useful or excellent Director could not possibly be found. He proposed his re-election.

Sir CORBET WOODALL said he had much pleasure in seconding the motion, having known something of the work of Sir Charles elsewhere. He could only say that the more one knew of that work, the better one was pleased to have further enjoyment of it.

The motion was heartily agreed to.

The CHAIRMAN next proposed the re-election of Mr. Charles L. Morgan, also speaking highly of his services to the Company.

Mr. WILLIAM CASH, in seconding, said those who knew Mr. Morgan best would be most sorry to lose his services. He brought to the Board technical knowledge; and it was a great benefit to have his assistance.

The motion was cordially carried.

Proposed by Mr. ARTHUR WOODS, and seconded by Mr. T. P. FISHER, Mr. J. C. Benwell, F.C.A., was re-elected one of the Auditors.

Moved by Mr. WOODS, and seconded by Mr. F. G. BARRETT, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, on behalf of his colleagues and himself, expressed his thanks. Proceeding, he said he did not think they ought to leave on this occasion without specially acknowledging their indebtedness to their staff. He had already incidentally done this in his address; but if it was only to have their new Acting Manager on his legs for the first time at their meetings he should feel disposed to propose the resolution. He was sure, too, that Major Woodall would be most sorry that he was not present to hear the speech which his representative would make. It was a pleasure to work with Mr. Moon. He was doing his work thoroughly well. He represented the earnest and enthusiastic staff at Bournemouth just as Mr. Plumb represented their good staff in London. The proprietors were grateful to them all.

Mr. W. RICHARDS said he was very sorry Major Woodall was not with them that day. But, speaking on behalf of the proprietors generally, they admired the patriotic spirit in which he had gone to assist the country at this time. Would it be possible to send some message of appreciation from the proprietors to their staff who had gone to the front? If this could be accompanied by some small gift, as a token of their appreciation in the trying circumstances in which they were placed, he was sure that it would be the wish of the proprietors that this should be done. They were assisting the dependants of the men; and he felt that some message direct from the proprietors to the men would be appreciated. He had much pleasure in seconding the motion.

The CHAIRMAN said the Board were looking out to do the right thing at the right time in recognition of two loyalties—loyalty to the country, and loyalty to the Company. There would be ample opportunities before this business was done with to look after their friends who were actively serving the country.

The motion was cordially passed.

Mr. PLUMB, in responding, said the whole staff appreciated every six months this hearty vote of thanks. They had all had a particularly

heavy half year, and there was another now in front of them. But everyone would do his best.

Mr. Moon said he should like to thank the proprietors, on behalf of the Bournemouth staff, for this very cordial vote of thanks. He was sorry he could not conscientiously adopt the Directors' example, and simply content himself by saying "I thank you for your confidence." He felt that this would be hardly fair to the staff he represented, and who had helped so loyally in the work at Bournemouth. As the proprietors might imagine, one could not take away 140 men out of 600—the 140 being in many cases highly-trained men—without throwing a very considerably increased responsibility upon the men who were left behind. He was glad to be able to testify to the fact that all the men remaining behind had risen to their duty splendidly. They had worked early and late. They had done well, without a single complaint of any sort; and they had worked efficiently, as could be judged by the balance-sheet. That as a result of this they had to some extent earned the approbation and confidence of the proprietors was in itself sufficient reward for them. But he was very anxious they should not appear to take the whole of this confidence and approbation to themselves. He was glad the Chairman in his address struck a note which had been very much with them all at Bournemouth the last six months. It was a thought that he should like to emphasize, and leave with the proprietors. It was that, although their chief, Major Woodall, was away serving his country and King in India, still his work at Bournemouth lived on, because it was due to the very solid foundation, good organization, and efficient methods that he laid down in Bournemouth that they were able, under exceptionally difficult conditions, to successfully carry on the work. He did not think a better tribute could be paid to a chief than to say he worked so well, and planned so well, that in his absence the work was able to go on almost with the same efficiency as if he was present. He thanked the Chairman and Directors and proprietors for their kind appreciation.

PORTSEA ISLAND GASLIGHT COMPANY.

The Half-Yearly Meeting of the Company was held at Portsmouth on Thursday, the 18th ult.—Mr. R. Edgcombe Hellyer (the Chairman) presiding over a somewhat larger attendance than usual.

The Chairman, in moving the adoption of the report and accounts, first referred with deep regret to the death of Colonel Charles Lanyon Owen, J.P., who had been associated with the Company for many years, first as an Auditor and for the last five years as a Director. Proceeding, he reminded the proprietors that the last time they met was a few days only after the outbreak of war, and that he had then expressed a hope that the Company would be able to fulfil their obligations to the public. He was pleased to say they had done so, without increasing the price of gas or reducing the dividend. It was quite true that the profits for the half year were less than the amount of the dividend, by a little over £1100, and that it would be necessary to draw to this extent upon the amount brought forward; but, having regard to the abnormal conditions, he considered the results obtained most satisfactory. One of the contributory causes of the reduced revenue was the low prices obtainable for residuals, which had been the general experience of all companies; but the chief reason was the terrible war, which had not only caused a reduction in the sale of gas, but considerably increased the expenditure for raw materials and labour. Great difficulties had been experienced in obtaining deliveries of coal and oil, owing to the restriction of transport by rail and sea, in consequence of which it had been necessary to reduce the gas pressure throughout the district. Representations on the matter had been made to the various authorities; and the Company and the public of Portsmouth were under the deepest obligations to the Mayor, the Naval and Military Authorities, and the railway officials, who had one and all done their very best to assist the Company in meeting their difficulties. As to the accounts, he did not propose to refer to them in detail, as, in the exceptional circumstances, no useful purpose would be served by comparing them with the previous year's figures. The reduced sale of gas—1·74 per cent.—was principally due to the reduction in outdoor lighting, and the earlier closing of licensed premises; and he felt confident that, had it not been for the war, the large increase which the first half of the year had shown would have been maintained. As it was, the sales for the whole year showed an increase of 47 million cubic feet, or 3·29 per cent. Although he anticipated considerable increased costs for the current half year, the Directors were most anxious to avoid any increase in the price of gas. Subject to deliveries of coal and oil being obtainable on the terms of the new contracts which had been made, he hoped it would be unnecessary to do so; and he promised that such a course would not be taken, unless circumstances which could not be foreseen made it imperative. He referred to the absence of Captain R. J. E. Baker (a member of the Board), who was serving in the 4th Battalion of the Royal Sussex Regiment, and stated that over 90 of the Company's employees had also joined His Majesty's Forces. In conclusion, he expressed the high appreciation by the Board of the manner in which the staff had cheerfully carried out the additional work which had resulted through the absence of those engaged on Naval or Military duties, and to the valuable services rendered by the Secretary (Mr. Herbert A. Stibbs) and the Engineer and General Manager (Mr. J. D. Ashworth) in these trying times.

The report and accounts having been unanimously adopted, the usual dividend was declared; and the election of Mr. William Gillman, J.P., who had been appointed a Director in the place of Colonel Owen, was confirmed.

Beaufort and District Gas Company.—In the third annual report of the Directors of the Company (the Chairman of which is Mr. W. P. Gibbons, J.P.), it is stated that the profit for the past year amounts to £376, which, with the balance brought forward, gives a total of £431. The Directors recommend the payment of dividends at the rate of 5½ per cent. per annum (less income-tax) on both the preference and ordinary capital.

HUDDERSFIELD GAS-WORKS MANAGEMENT.

At a Meeting of the Huddersfield Trades and Labour Council last week, a discussion took place upon the subject of the management of the gas-works.

The matter arose out of a report by Alderman Wheatley, as to the business at a recent meeting of the City Council. He explained, in very guarded language, the trouble which had occurred between the Gas Committee and the late Manager-Engineer (Mr. E. A. Harman), which, he said, was due to the fact that the Committee had come to the conclusion that the required results were not being obtained. The Committee thought they were not getting the value out of the coal in the carbonizing process, that the quality of the coke was not what they would like to see, and that the general order of the establishment might be improved. Seeing there was a capital at stake of between £300,000 and £400,000, they wanted to try their best.

In reply to a number of questions, Alderman Wheatley said the Chairman of the Gas Committee, who had resigned, had taken an extraordinary interest in his position, and had given great thought, time, and attention to his duties. Having come to a certain conclusion, the Chairman had made a report to his Committee, and gave them to understand that, if certain actions and consequences did not arise, he would resign. Since then some doubt had arisen in relation to the actual terms of the resignation.

The report was accepted.

HIGHER GAS PRICES FOR BIRMINGHAM.

The New Scale of Charges.

As was foreshadowed last week, the Birmingham City Council will, at their meeting to-day, be asked by the Gas Committee to adopt an increased scale of charges for gas.

In the report to be submitted, the Committee point out that fourteen years have elapsed since the price of gas in Birmingham was advanced; and during this period the average price charged has been reduced by 7d. per 1000 cubic feet. It is with regret, therefore, that they have now to recommend the Council to approve a new scale which involves some increase in charges. They have deferred taking this step as long as possible, notwithstanding the great increase in the cost of all raw materials and labour since the last revision of prices in January, 1912; but during the past year the position has been rendered even more difficult in consequence of the serious fall in the prices realized for all residual products. The abnormal conditions created by the war have still further adversely affected the markets for tar and liquor, and have, directly and indirectly, burdened the department with many other heavy additional charges. The assessment of the undertaking for local rating has also been increased by a further £14,000; and though the results of the year's trading will not be definitely known until after the end of March next, in view of all the circumstances mentioned the Committee feel the prices charged for gas must be increased without further delay. They accordingly recommend that the following scale of prices shall operate as from the March reading of the meters.

A.—For lighting and domestic purposes in one premises—

Up to and including 100,000 c. ft. per quarter	2s. 0d. per 1000 c. ft.
Quantity in excess of 100,000 up to 500,000 c. ft. per quarter	1 11 ,, ,, ,,
Quantity in excess of 500,000 c. ft. up to 1,000,000 c. ft. per quarter	1 10 ,, ,, ,,
Quantity in excess of 1,000,000 c. ft. up to 2,000,000 c. ft. per quarter	1 8 ,, ,, ,,
Quantity in excess of 2,000,000 c. ft. up to 3,000,000 c. ft. per quarter	1 6 ,, ,, ,,
Quantity in excess of 3,000,000 c. ft. up to 4,000,000 c. ft. per quarter	1 4 ,, ,, ,,
Quantity in excess of 4,000,000 c. ft. per quarter	1 3 ,, ,, ,,

B.—For manufacturing and motive power in one premises—

Up to and including 1,000,000 c. ft. per quarter	1s. 7d. per 1000 c. ft.
Quantity in excess of 1,000,000 c. ft. up to 2,000,000 c. ft. per quarter	1 5 ,, ,, ,,
Quantity in excess of 2,000,000 c. ft. per quarter	1 3 ,, ,, ,,

[The above prices are subject to 5 per cent. discount for prompt payment.]

C.—For supplies of gas through prepayment meters—

With gas fittings and cookers free	35 c. ft. per penny
With cookers only free	39 ,, ,,

The present scale of charges, as follows, is added for comparison.

A.—For lighting and domestic purposes in one premises—

Under 50,000 c. ft. per quarter	1s. 11d. per 1000 c. ft.
50,000 to 250,000 c. ft. per quarter	1 9 ,, ,,
250,000 to 1,000,000 c. ft. per quarter	1 7 ,, ,,
1,000,000 to 2,000,000 c. ft. per quarter	1 6 ,, ,,
2,000,000 to 3,000,000 c. ft. per quarter	1 5 ,, ,,
3,000,000 to 4,000,000 c. ft. per quarter	1 4 ,, ,,
4,000,000 to 5,000,000 c. ft. per quarter	1 3 ,, ,,
Above 5,000,000 c. ft. per quarter	1 2 ,, ,,

B.—For manufacturing and motive power in one premises—

Under 1,000,000 c. ft. per quarter	1s. 4d. per 1000 c. ft.
1,000,000 to 2,000,000 c. ft. per quarter	1 3 ,, ,,
2,000,000 to 3,000,000 c. ft. per quarter	1 2 ,, ,,
3,000,000 to 4,000,000 c. ft. per quarter	1 1 ,, ,,
Above 4,000,0000 c. ft. per quarter	1 0 ,, ,,

[The above prices are subject to 5 per cent. discount for prompt payment.]

C.—For supplies of gas through prepayment meters—

With gas-fittings and cookers free	35 c. ft. per penny
With cookers only free	39 ,, ,,

The basis of the scale has been broadened considerably, and differs

from the existing one in that all consumers pay the same price for some portion of the gas consumed; the lower prices only operating in respect of quantities in excess of those for which the maximum prices are charged. In the last two reductions, special consideration was given to the prices of gas used for manufacturing purposes, until to-day the rates charged in Birmingham are, it is pointed out, almost the lowest in the United Kingdom. Owing, however, to the increased cost of manufacture, on account of the higher prices for coal, and the reduced receipts for residuals, the Committee have felt for some time that it was impossible to maintain these very low prices, and that manufacturers could now fairly be asked to pay a price which, though higher than they have been paying hitherto, is still among the lowest in the country. After considering many proposals, the Committee have decided that the scale recommended is the most equitable one to all consumers. They have interfered as little as possible with the price charged to the small consumer, and do not recommend any alteration at present in the quantity of gas sold per penny through automatic meters.

The Committee are unable at present to say if the increases proposed will be sufficient to meet all the difficulties which may be encountered in the next twelve months.

WAGES AND THE COST OF LIVING.

There has been widespread discussion among the working classes of the question of existing rates of wages as affected by the general rise in prices of commodities; and requests for advances have been numerous. Gas workers have in various places been among those to seek some improvement in their rates of pay.

At the Manchester Town Hall early last week, the Lord Mayor presided over a conference held to consider what should be done in regard to applications by workmen in the different departments of the Corporation for increases of wages. It appears that such applications had been received from the organizations representing practically every department of labour, including gas workers. It was stated that if the requests are acceded to it will mean an addition of not less than £100,000 to the present annual expenditure in wages.

It is pointed out that the salaried class of Corporation officials have this year by common consent, and in agreement with the wish of their Committees, refrained from asking for any increase of salaries, though they are suffering like everybody else from the enhanced prices of food. The proceedings at the conference were private; but it is reported that a Special Committee, comprising the Chairmen of the leading Committees, was appointed to consider the question.

At a mass meeting of men employed at the Sheffield Gas Company, it was decided that all grades, from stokers to yardmen, should apply for an advance in wages of 3s. per week. The meeting was called by the Joint Committee of the three local gas-workers' branches of the National Union, and was addressed by Mr. Will Thorne, M.P., and Mr. Charles H. Blackburn (District Secretary). The men urged that they had shown their patriotism at the beginning of the war, when they withdrew an application for advances in wages and reduction in hours to 48 per week for all yardmen and shopmen; but, faced as they now were by abnormal food prices, they had no alternative but to press for an increase. It was felt that nothing less than the amount asked for would meet the situation.

A crowded meeting of Sheffield Corporation workmen also took place, to discuss the wages question. It was stated that they were feeling the pinch more than any other section of workers in the city. There was no overtime; and, owing to bad weather, a lot of time had been lost. It was resolved to amend the application for an increase in wages already sent in by the Amalgamated Union of Labour, so as to include all sections.

When the war started, it is pointed out, the Gas-Workers and General Labourers' Union sent all their members who were out on strike back to work, so as to avoid any possibility of the Government being harassed as the result of labour troubles. They also decided that no applications should be sent in for advances in wages until the war was over. Owing, however, to the great advance in the prices of food and fuel during the last two months, the General Council have rescinded their resolution, and have given permission to the various districts throughout the country to draw up and present as soon as possible applications for substantial advances in wages. At Bradford five meetings of different sections of Corporation employees have been arranged to consider the increased cost of living and an application for an advance in wages, and to ask the Corporation to employ no workman who cannot produce a union card.

The Finance Committee have prepared a special return to submit to the Birmingham City Council, showing what would be the financial result of carrying into effect a proposal to pay all workmen who have been in the employ of the Council over twenty years a wage of not less than 30s. per week. The total number of men who would be affected is 6948; the direct cost would be £39,008; and the consequential cost £27,348—a total of £66,356 per annum. The Gas Committee would have 1990 men affected, the Public Works Committee 1221 men, and the Tramways Committee 1201 men. The cost to these three Committees would be: Gas—£7475 direct, and £12,216 consequential; public works—£8684 direct, and £4014 consequential; tramways—£6422 direct, and £2000 consequential.

Gas Prices and Wages at Smethwick.—The Smethwick Town Council, at a meeting last Tuesday, adopted a recommendation of the Gas Committee that, in view of the serious increase in the cost of production and the diminished income from residuals, the price of gas be increased as follows: Ordinary consumers, under 50,000 cubic feet, 2s. 5d. per 1000 feet; 50,000 and under 500,000 feet, 2s 3d.; over 500,000 feet, 2s. 2d. For motive power purposes, under 2,000,000 feet, 1s. 7d.; 2,000,000 to 3,000,000 feet, 1s. 6d.; and 3,000,000 feet and upwards, 1s. 5d. The question of giving a war bonus to the men to meet the increased cost of living was raised, and Alderman Goodyear promised to bring the matter before the Committee.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

At the meeting of the Edinburgh and Leith Gas Commissioners on Monday, the minutes presented by the Works Committee contained a report by the Engineer and Manager (Mr. Alexander Masterton) on applications made by the workmen for "country money" and "sick allowance." A deputation had been received from the National Union of Corporation Workers, and, when questioned on the point, they were unable to give any cases of payment of "country money" by gas undertakings; and Mr. Masterton pointed out that the operations in the outlying districts are now of a comparatively light nature, and that the men have seldom far to walk to obtain the train or tramcar, the expense of which is borne by the Commissioners. From inquiries he had made in regard to other large gas-works, Mr. Masterton found that in only one instance—viz., Glasgow—was an allowance of time granted. But no train or tram fares were paid, and the men had to work their full day's time on the job; so that practically one made up for the other. He recommended, in order to remove any possible hardship on the men, that it be understood that in all cases of work beyond the city boundary the regular hands should travel one way in the Commissioners' time and one way in their own; that the full working day be spent on the job; and the time of travelling not to be reckoned as overtime—the Commissioners to continue paying car or train fares as at present. With regard to sick allowance, Mr. Masterton said he had learned from the various departments in the city that about seven months ago the Corporation decided to grant to their employees sick allowance equal to full pay for three weeks and half pay for other three weeks during each full year, subject to deduction of the amount received under the National Health Insurance Act, and after six months' continuous service. In the event of the Commissioners deciding to grant something in the way of sick allowance, he thought it might be advisable to stipulate that this would not come into force until the fourth day of illness, in the same way as is specified in the National Health Insurance Act. But, in view of the strenuous times through which we are passing, and "the extreme likelihood of a large deficit at the end of the financial year," he thought it was a question whether the present was quite an opportune time for the discussion and final settlement of the requests brought forward by the Union. The Commissioners adopted the recommendation in regard to "country money," and decided to grant to all their workers a sick allowance in accordance with the practice of the Corporation, from the first day of the illness, as certified by a medical certificate to be produced by the employee.

At the same meeting, the Works Committee informed the Commissioners that the Engineer and Manager had reported as to the deficient supplies of coal he was receiving, and the consequent difficulties experienced in making the quantity of gas required. The Committee instructed representations to be made to the coal contractors, and authorized an advertisement for the supply of oil needed for the requisite production of gas. Tenders had been received, and the Committee recommended the purchase of 800 tons. This was agreed to. The Lord Provost said they were now getting more money for sulphate of ammonia. The last sale came up to something like what the price ought to be; and he hoped it would continue.

At a meeting of the Gas Committee of the Glasgow Corporation on Tuesday it was reported that, owing to the high price of coal, there had recently been a great increase in the consumption of gas. This had further affected the stocks of coal at the various gas-works. There had been a serious reduction in these stocks since the war began, and the deliveries of coal in fulfilment of contracts were still inadequate. The Committee instructed Mr. Alexander Wilson, the Manager and Engineer, to take steps to maintain the supplies of coal.

The Buckhaven Town Council have approached the East Wemyss and Buckhaven Gas Company, Limited, and the Leven and Methil Gas Company, Limited, with a view to acquiring the works of the former and the pipes of the latter Company so far as these are in the burgh. In none of the Scottish gas municipalization schemes have the same conditions arisen. The burgh is served on the west side by works situated in Wemyss, using two-thirds of the quantity; while on the east it draws one-third of the gas made in the Leven works.

The question of liability for personal injuries arising from the reduced public lighting necessitated by the existing war conditions came before Sheriff Armour-Hannay in the Kirkcaldy Sheriff Court last Wednesday, in an action brought at the instance of Mrs. Isabel Hugh, or Cook, against the Kirkcaldy Town Council. Pursuer claimed £10 damages in respect of injuries sustained by her through falling over a grating; and she attributed the accident to the fault of the defenders in not providing adequate lighting. Defenders denied liability, and pleaded that they had been requested by the Secretary for Scotland to reduce the lighting in the burgh after the outbreak of war, and that, in any event, the damages sued for were excessive. Pursuer's agent maintained that the letter from the Secretary for Scotland was a mere request, and that no proper order had been issued for the burgh, at the time the accident occurred, making it compulsory that the lighting should be reduced. The agent for the defenders admitted that the letter from the Secretary for Scotland did not come up to an order. He maintained, however, that, according to the Burgh Police Act, it was left to the discretion of the Town Council to light the streets in a suitable manner; and in the present crisis it was quite reasonable for the defenders to put out half the lights and shade the remainder. His Lordship said he quite recognized that the Council were acting on behalf of the community; and it seemed to him that an ordinary precaution for a person going into a badly-lighted street would be to carry a lantern. The agent for the pursuer said that it was not permissible in Kirkcaldy to carry even a lantern with a tallow candle. Proof was fixed.

The Directors of Bruce Peebles and Co., Limited, in their report presented to the shareholders at the annual meeting yesterday, stated that the works have been fairly well employed during last year, and the results showed satisfactory and steady progress. After deducting

administration expenses and interest paid on the mortgage debentures, and allowing for interest accrued on the unsecured debentures, there remained a profit of £3892. The Directors recorded, with deep regret, the loss of Mr. A. Bruce Anderson, who perished in the wreck of the "Empress of Ireland."

After a long period of usefulness, the Leith Gas-Works are to be sold by public auction. The price asked is £12,000 for substantial old buildings covering 3¼ acres.

The acquisition of the Inverkeithing Gas Company's business and works is at present a subject for negotiation. It is anticipated that the Town Council will take possession as soon as terms are arranged. Meanwhile the Company propose to proceed with the immediate extension of the retort-house. There has been a constant increase in the demand for gas during the past two years.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 1.

Tar products generally remain quiet, as before reported. The position of pitch is still dominated by the question of freight, but the price can be called from 23s. to 24s. per ton net at sellers' works. Other values remain at the figures reported last week.

The position of sulphate of ammonia is well maintained, and makers are unwilling to sell even at £13 12s. 6d. per ton net, at makers' works, for 25 per cent. quality.

Tar Products in the Provinces.

March 1.

The market for tar products has been steady throughout the past week. Benzol is a little firmer in some quarters, but generally is unchanged. Solvent naphtha has rather improved in price; and there is also a little better demand for heavy naphtha. Carbolic acid remains very firm, and sales are reported at somewhat advanced prices.

The average values during the week were: Value of liquid products in one ton of tar, 17s. to 18s. Benzol, 90 per cent., naked, North, 9½d. to 10½d.; 50-90 per cent., naked, North, 1s. 3½d. to 1s. 4½d. Toluol, naked, North, 2s. 2d. to 2s. 4d. Crude naphtha, in bulk, North, 5½d. to 5¾d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 5d. Heavy naphtha, naked, North, 11½d. to 1s. 0½d. Creosote, in bulk, North, 3½d. to 3¾d. Heavy oils, in bulk, 4d. to 4¼d. Carbolic acid, casks included, 60 per cent., East and West coasts, 3s. 1d. to 3s. 2d. Naphthalene, £7 to £11; salts, 65s., bags included. Anthracene, "A" quality, 2d. per unit; "B," nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Feb.* 27.

During the past week there has not been any improvement in the demand for this article, and the tone of the market has continued dull. Foreign orders have been checked by the delay in effecting shipments from this country, and the requirements for home consumption have not been large. The closing quotations are, however, unchanged at £13 12s. 6d. per ton f.o.b. Hull, £13 13s. 9d. per ton f.o.b. Liverpool, and £13 18s. 9d. per ton f.o.b. Leith. Notwithstanding the slowness in the near position, manufacturers have advanced their price for July-December delivery to £13 5s. per ton f.o.b. good port, but it has not been reported that they have actually realized this figure.

Nitrate of Soda.

This market has remained steady at 11s. per cwt. for ordinary quality, and 11s. 6d. for refined, on spot, with a fair business passing thereat.

Sulphate of Ammonia.

From another source it is reported that this article has been steady throughout the past week, and prices closed London terms about £13; Hull, £13 12s. to £13 15s.; Liverpool, £14; Leith, £13 17s. 6d. to £14; Middlesbrough, £13 15s.

COAL TRADE REPORT.

Northern Coal Trade.

The northern coal trade is quieter on the whole. The demand is still steady; but the high prices quoted for some classes of coal impede business. Producers, too, have sold forward, and thus are not so eager to take fresh orders, unless at relatively high prices. In the steam coal trade, best Northumbrians are about 18s. 6d. per ton f.o.b. for prompt delivery, and up to 20s. per ton for forward; second-class steams are about 17s. per ton; and steam smalls vary from 10s. to 12s. per ton. There appears to be a rather better dispatch of coal from the collieries, and this may influence the market soon. In the gas coal trade, steamers are difficult to charter, so that the prices are influenced by this. For best Durham gas coals, from 12s. 6d. to 13s. per ton is still about the current quotation. Second-class gas coals are near 11s. 9d. to 12s. per ton; and for "Wear" Specials, about 13s. 6d. per ton is the f.o.b. price. In regard to contracts, the large supplies for the Gas Light and Coke and South Metropolitan Gas Companies are attracting attention. Some statements of the "prices expected" to rule in these contracts have been made; but as far as can be learned, they are guesswork. The opinion may have more foundation that the price will not generally be very much different from that of the present average. Coke is on the whole steady. Though gas coke is not being as freely exported as a year ago, the production is less, and the local demand is better in some cases. Good gas coke is from 12s. to 12s. 10d. per ton f.o.b.

Reading Gas Company.

Mr. J. Okey Taylor, who has been Chairman of the Reading Gas Company since its formation in its present style 53 years ago, presided at the annual meeting last Tuesday, when he pointed out that, notwithstanding the difficulties with which they had had to contend, the Company were able to pay their full dividends and remain possessed of a considerable surplus. He said the patriotic feeling of the staff and workers had been fully evidenced by the fact that ten of the former and 58 of the latter had joined His Majesty's Forces; and to them supplementary allowances had been granted, according to circumstances, as well as a promise of re-instatement. The report, which was adopted, stated that the sales of gas during the first half of the year showed a substantial increase; but the interruption to business caused by the war had made itself felt in some respects. At the same time, the use of gas for cooking, heating, &c., had advanced very satisfactorily. The contract for the public lighting of the town had been obtained for a period of ten years. Good progress had been made with the construction of a 2 million cubic feet gasholder. [This holder, the Chairman pointed out, is being erected to the plans and specifications of the Company's Engineer, Mr. D. H. Helps.] The income for the year was £114,092, and the expenditure £98,733, leaving a balance of £15,359 to go to profit and loss account. Out of the sum available for distribution, the Directors recommended the payment of dividends for the past six months at the rate of 5 per cent. per annum on the preference shares and ordinary stock; interim dividends at this rate having been declared in September for the first half of the year. At the close of the ordinary meeting, a special meeting was held, when the Directors were authorized to raise further capital, to enable them to carry out extensions necessitated by the increasing use of gas in the district.

York Gas Company.

The accounts of the Company for the past year which were presented at the meeting of shareholders last Thursday showed a profit of £15,139. Adding the balance brought forward, there was provided a sum of £30,279. Deducting debenture interest, the interim dividend, and the amount written off capital account for dismantled plant, totalling in all to £9545, there was left a balance of £20,734, out of which the Directors recommended the payment of dividends of £2 per cent. on the preference stock and £2 4s. per cent. on the consolidated ordinary stock (both less tax); making £4 and £4 4s. per cent. for the year. These would absorb £8283, and leave £12,451 to be carried forward. The Directors reported an increase of gas sold, compared with the year 1913, of more than 13 million cubic feet, which was largely accounted for by the consumption of gas by the military authorities and the circumstances set up by the war. There were 11,671 yards of new and supplementary mains laid, and some old mains were relaid; 422 meters were fixed for new consumers, and 948 additional cookers, grillers, &c., and 529 gas fires and radiators had been supplied. The Chairman (Mr. A. Procter), in moving the adoption of the report, said the working fell short of that of the previous year; but he thought, making due allowance for the existing unprecedented circumstances, the Company's position was by no means unfavourable. The war had brought them a substantial increase of business by the occupation of many temporary quarters in the city by the troops. The ordinary expenditure had been £3471 more than in 1913, due in great measure to heavy expenditure on repairs and maintenance of plant. The wages bill had also been materially increased. The Directors had considered the immediate and probable future effects of the war on the position of the Company, and had been reluctantly forced to the conclusion that, in the interests not only of the proprietors but of the consumers, it was necessary to raise the price of gas as from the March meter readings by 2d. per 1000 cubic feet, making the ordinary price 2s. 3d. The report was adopted.

Willesden Public Lighting.—At the last meeting of the Willesden Urban District Council, the Finance Committee reported that the Gas Light and Coke Company had intimated that they could not accede to the Council's application for a rebate to the extent of more than 6d. per 1000 cubic feet of gas saved as the result of the Admiralty order with regard to reduced street lighting. The total allowance in respect of the quarter ended the 31st of December last was £137 14s. 6d. It was resolved to inform the Company that the Council were dissatisfied with the offer, and were of opinion that a further allowance should be made in respect of the saving in mantles, to the approximate number of 2800 per quarter.

New Issues of Gas and Water Capital.—Three new issues of capital were successfully placed by Messrs. A. & W. Richards, by order of Directors, at the Mart, Tokenhouse Yard, E.C., last Tuesday. The first lots consisted of 5 per cent. "A" £10 preference shares in the Herts and Essex Water-Works Company, Limited; and they were all sold at par. Some 5 per cent. preference stock and additional 7 per cent. stock of the Brentwood Gas Company were next offered; and the former fetched £95 to £96, and the latter £118, per £100 of stock. The final lots were a new issue of £5000 of 5 per cent. consolidated preference stock of the Falmouth Water-Works Company; and it was all sold at £100 10s. to £101 per £100.

Death at West Bromwich Gas-Works.—An inquest has been held on the body of James Butwell (53), a carter in the employ of the West Bromwich Gas Department. The widow said her husband had always enjoyed good health, and had never had a doctor until the end of last August, when he fell down while tipping a cart at the gas-works. He afterwards complained constantly of an injury to his back. Sidney Shutt, a labourer at the works, said on Sunday week he and deceased were loading a boat of coke at the wharf. Deceased went on in front with his horse and cart; and when witness got to the wharf he found him lying at the side of the cart dead. Dr. Trimble, who made a post-mortem examination, stated that death was due to syncope. The Coroner remarked that there was no evidence to show that deceased had met with any accident; and the Jury returned a verdict of "Death from natural causes."

Redhill Gas Company's Jubilee of Incorporation.

The fifty-fifth annual meeting of the Redhill Gas Company last Wednesday marked the jubilee of the Company's incorporation; gas having been supplied for several years before the Special Act was obtained. The undertaking has grown in a remarkable manner; and at the present time the customers number over 5000, while the quantity of gas sold during 1914 exceeded 141 million cubic feet. Last year the output increased by 1·63 per cent.; the price of gas having been reduced 2d. per 1000 cubic feet (to 3s. 4d.) on July 1. A co-partnership scheme was inaugurated at the beginning of the year, and is working satisfactorily—the employees showing marked appreciation. Dividends were declared at the rate of 10 per cent. on the share capital and 5 per cent. on the "B" stock, both less income-tax, leaving a balance of £1126 to be carried forward. The Chairman (Mr. G. R. Hunt) said that, thanks to the foresight of their Engineer and Manager (Mr. W. H. Bennett), they held a large stock of coal. Early in the year, they found that the supply of gas to the outlying districts of Walton and Kingswood was becoming inadequate; and with a view to increasing the supply, and at the same time to provide gas for Buckland, Betchworth, and Brockham, they were laying some 10 miles of high-pressure steel main. Several of the employees had joined the Colours, and were receiving half salary or wages during their absence. At a subsequent extraordinary meeting, the Directors were authorized to raise additional capital.

Tonbridge Gas Company.—The Chairman of the Company (Mr. A. H. Neve), when moving the adoption of the report and accounts at the recent annual meeting, said the expenditure for the production of gas had been £11,000, which was practically the same as for 1913, though the output had risen by upwards of 8 million cubic feet—the largest increase for many years. Moreover, though wages had recently been raised, there was a saving of some £50 on this account. The first reason for this satisfactory state of affairs was the excellent management of Mr. Donaldson (the Engineer and Secretary), to whom the Company were greatly indebted for his economy, foresight, and wise policy. The second reason was that for some time past they had been improving their machinery, with the result that they had a better make of gas for every ton of coal used and every pound expended in wages. He would not say what might happen in the future, but for the present there would be no increase in the price of gas. The motion was carried. Thanks were accorded to the Chairman and Directors, and likewise to Mr. Donaldson and the staff. Mr. East, who proposed the latter vote, said he was quite certain Mr. Donaldson had the interest of the Company very deeply at heart; and he also greatly appreciated the services of Mr. West (the Assistant Engineer), who ably seconded all Mr. Donaldson's efforts. The latter, in responding, stated that when the war broke out the Company lost 16 out of 42 workmen and 11 out of 15 fitters.

Conscientious Coal-Owners.

Under the heading of "A Company with a Conscience," the "Ironmonger" last Saturday made the following remarks: "The injury which is being done to national interests by the present undue inflation of coal prices can scarcely be exaggerated. Coal contracts are suspended, and users who had covered their wants for long periods are now being compelled to buy in the open market at exorbitant rates, sometimes amounting to nearly twice the contract price. But every rule has its exceptions; and a fine example to other colliery-owners has been set by the Brodsworth Main Colliery in Yorkshire. At a meeting held this week, the Directors took a remarkable step, with the object of relieving industry from the evils of excessively dear fuel. They described some of the figures which are being asked as 'outrageous,' and declared that in a time like the present no trade ought to take advantage of its opportunities of inflicting additional burdens upon the public. The Directors did not confine themselves to the utterance of these fine sentiments; for they decided that at the four large collieries which they control (Brodsworth, Hickleton, Bullcroft, and Oxcroft) no coal shall be sold at more than 15s. a ton at the pit's mouth. This is about 2s. per ton above the contract rates, and, in view of the increased costs of working the pits, is quite reasonable. The Company's collieries are situated in South Yorkshire and Derbyshire; and as their aggregate output exceeds 4 million tons a year, the decision of the Directors must put an end to the practices of many of the coal-owners who are now making huge profits. So far as Derbyshire and Yorkshire are concerned, 15s. a ton will probably become the standard maximum price. The Directors who are responsible for this public-spirited action are Sir Arthur Markham, M.P., Mr. Robert Armitage, M.P., Mr. C. E. Rhodes, and Mr. R. Westlake. The announcement has caused a pleasant surprise in industrial circles, because in the past coal-owners have not generally been backward in taking advantage of occasions when contracts can be set aside."

Vertical Retort Working at Exeter.—Addressing the shareholders at the annual meeting of the Exeter Gas Company, Mr. G. Hardy Harris said they were getting 12,000 cubic feet of gas from every ton of coal, thanks to the vertical retorts, which were entirely up to expectation, and had quite justified the expenditure upon them. The cost of manufacture had been in every way satisfactory. They had been obliged to put up the price of gas; but it was still being sold at a reasonable figure. Some 18 per cent. of the permanent staff had enlisted, as compared with 10 per cent. on the railways, and 13·9 per cent. in mining. The Board had seen that those who had enlisted, as well as their wives and families, were no worse off than before the war. The depletion of the staff left a great burden on those remaining. They had worked well, and he specially acknowledged the services of the Secretary and Manager (Mr. W. N. Westlake) and the Works Manager (Mr. Wood). The report [*ante*, p. 398] was adopted.

Main Matters.

THE swelling popularity of the "Main" Gas Cookers is explained by their true qualities. While they are made in many different sizes and designs, they are all similar in that they are reliable, durable, and of real value. Mains are the cooker experts and are equipped to deal with every class of cooker business. Let them deal with yours.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N. Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

Sunderland Gas Company.

The annual meeting of the Sunderland Gas Company was presided over by the Mayor (Alderman Stansfield Richardson), who is Chairman. In moving the adoption of the report and balance-sheet, he said the business was quite satisfactory during the first six months of the past year. During the last half, however, owing to the war, more had to be paid for materials used, and less had been received for residuals. The price of gas—and this was something to be proud of—remained the same. In consequence, the profit of the year was £22,336, as against £25,144 in 1913. The reduction compared favourably with other gas undertakings; and there was ample to pay the usual dividend. Since the start of the war, 13 officials and 90 workmen of the Company had joined His Majesty's forces. This was a large percentage of the total number employed. Any loss their patriotism occasioned them would be made up to them by the Company. Rates, taxes, and insurance had increased by £8144, partly owing to increased assessment and insurance against war risks. After the report had been adopted, dividends were declared of 5 per cent. on the original stock and 4¼ per cent. on the additional capital stock; and a resolution was passed approving of a donation of £250 which the Directors had sent to the Prince of Wales's Fund.

Lancaster Corporation Gas Undertaking.

The year has been a disappointing one, owing to the effect of the war on the market for residuals, besides the increased price of coal. Instead of being able to hand over £4000, as estimated, at the end of March, the sum is not likely to exceed £1750. Sir N. W. Helme, M.P. (the Chairman of the Gas Committee), last Wednesday said that, in place of the estimated surplus of £4279, there was a net increase of expenditure of £628, and a decrease of revenue of £1853, leaving a balance of £1747 to carry forward. In the past, they had adopted a sound policy, developing the works out of profits, and increasing their productive power without increasing the capital. They had contributed no less than £43,357 in aid of the rates, and had given £13,500 value in free gas to the Lighting Committee. In order to help the rates, money which should have gone to reserves had not always been placed there; and now the Finance Committee must finance the town without trespassing on the gas profits, till they were in a stronger position. They had to ask the Committee to find £4000 this year. They felt also that they must ask the gas consumer to pay an increased price. The charges to ordinary consumers would be 2s. 4d. (an increase of 4d.) per 1000 cubic feet; and motor users would pay 2s. 3d. After discussion, the minutes were confirmed.

Increase in Price at Dover.—Owing to the enormous increase in freight charges, and the cost of transport, consequent on the war, added to the high price of all raw material and the reduction in value of residual products, the Directors of the Dover Gas Company have been compelled to raise the price of gas 3d. per 1000 cubic feet.

Bristol Water Company.

At the annual general meeting of this Company to-day, the accounts to be presented for the year 1914 will show that the water-rates amounted to £165,297—an increase of £3512. The total revenue was £177,537, and the expenditure £98,611; leaving a balance of £78,926, which is applicable for distribution. Out of this an intermediate dividend at the rate of £7 17s. 6d. per cent. per annum on the ordinary shares, and £5 10s. 3d. per cent. per annum on the 7 per cent. maximum consolidated ordinary stock, was paid on the 5th of September; leaving an available balance of £44,917. The Directors recommend the payment of final dividends at the respective rates of £8 2s. 6d. per cent. per annum on the ordinary shares, and £5 13s. 9d. per cent. per annum on the ordinary stock of the Company; leaving £9829 to be carried forward. The additional pumping engines referred to in the last report have been at work since April, and give very satisfactory results. The covering of the Oakfield Road reservoir with ferro-concrete on the Hennebique system has been carried out successfully. The Bill pending in Parliament at the date of the last report, to confer upon the Company further capital powers, was duly passed; and the additional capital thereby authorized has been issued as 4½ per cent. perpetual preference stock at a premium. The capital expended during the year was £19,349. The Engineer (Mr. J. A. Macpherson, B.Sc.) reports that the works are in good condition.

Grays and Tilbury Gas Company.

The half-yearly meeting of the Company was held yesterday week, when dividends at the rate of 8½ per cent. per annum on the "A" shares and of £5 19s. per cent. on the "B" shares (less income-tax) were declared. The Chairman (Major F. E. Bartlett) was able to congratulate the shareholders upon a very successful half-year's working. The dividends recommended had been fully earned. The revenue account showed a profit of £5568; and, after providing for the fixed charges and placing £478 to the renewal fund, there remained a balance of £6476, of which the dividends recommended would absorb £3666, leaving £2810 to be carried forward. He said that the vertical retorts had now been completed, and satisfactory results were being obtained from them. The quantity of gas sold showed an increase of 21·08 per cent. compared with the corresponding period of 1913. The number of consumers was 8074, showing an increase of 266 for the half year; while 292 additional cooking-stoves and fires had been fixed. Mr. C. C. S. Fooks (the Deputy-Chairman) referred to the untiring efforts of his co-Directors in their management of the affairs of the Company during the absence of the Chairman, who, as they all knew, had the interest of the Company so much at heart, and also to the loyal and efficient manner in which the Engineer (Mr. A. W. Sumner) and Secretary (Mr. F. W. Whittaker) and their respective staffs, had carried out their duties during the trying period under review. A vote of thanks to them was proposed by Mr. T. J. Harding, seconded by Mr. F. W. Church. Both Mr. Sumner and Mr. Whittaker suitably responded.

THE . . .

"Super-Acme"

GAS COOKER.

Where other high-grade Cookers end is the starting point of the "Super-Acme." The "Super-Acme" is not another ordinary Cooker; it is the highest point yet reached in high-grade Gas Cooker Construction.

Emphatically the Ideal Cooker for Hire.

ARDEN HILL & CO.,
ACME WORKS,
ASTON, BIRMINGHAM.

Cooking and Heating Appliances in Glasgow.

We have received from Mr. Ralph Halkett, the Commercial Superintendent of the Glasgow Corporation Gas Department, the following figures, recently submitted to his Committee, showing the increased use of cooking and heating appliances in the city:

In Use on—	Cooking.	Heating.	Total.
May 31, 1912	100,693 ..	8,561 ..	109,254
May 31, 1913	172,152 ..	35,089 ..	207,241
Dec. 31, 1914	192,710 ..	45,321 ..	238,031
Net increase in 2½ years .	92,017 ..	36,760 ..	128,777

The hiring-out of cooking appliances by the Gas Department commenced in 1885.

Rochester Gas Company's Extensions.

The half-yearly meeting of the Rochester, Chatham, and Gillingham Gas Company, which took place recently, was presided over by Alderman E. W. Willis, J.P. (the Chairman), who said that last August they made some excellent coal contracts; but the war had upset these. A large number of the Company's workmen were serving with the Colours. The Directors felt they ought to treat them liberally; and he was certain it would be the wish of the shareholders that they should do so. They were paying the men half-wages; and this amounted to about £500 during the half year. The number of prepayment meters in use was now getting on for 12,000. They were a very valuable asset to the Company, and a great convenience also to the people who used them. The receipts were up by £1088. The gas made during 1914 was 30 millions more than in 1913. As to the new works at Gillingham, the Directors said last half year they hoped to have them going this winter; but owing to the war, the contractors had had the greatest possible difficulty in keeping the men at work. They dropped their tools, and went into the dockyard; and at times the contractors were left with very few men indeed. The consequence was the works were not nearly completed. [This work, it may be mentioned, includes the erection of a new holder, vertical retort-house, coal-store, &c.] The report was adopted, and a dividend at the rate of £5 2s. 6d. per annum (less income-tax) on the consolidated ordinary stock was declared. In proposing a vote of thanks to the Secretary (Mr. W. H. Day), the Engineer and General Manager (Mr. C. V. Bennett), and the staff, the Chairman remarked on the loyalty of the whole staff, and said Mr. Bennett had at present to divide his time between the Company's business and military duties at Bromley.

At their next meeting, the Halifax Town Council are to be asked by the Gas Committee to accept a tender for £33,276 for the erection of a vertical retort stack.

Increased Gas Consumption at Ipswich.

In moving the adoption of the report and accounts of the Ipswich Gas Company for the past year, at the annual meeting of shareholders on Monday last week, the Chairman (Sir Daniel F. Goddard, J.P., M.P.) said that notwithstanding the fact that the darkened streets and gloomy shops told a tale which was not at all helpful to a gas company's interests, the Directors were able to say that the sales of gas during the past year had reached the large total of 524 million cubic feet, which was an increase of nearly 9 millions over 1913. If they had maintained the rate of increase which was recorded in the first half of 1914, they would have doubled this amount of gain; but the war, which had overshadowed everything, had cut a dividing-line almost through the year. During the first half, the increase in the quantity of gas sold was 4·1 per cent.; while in the second half there was a decrease of 0·72 per cent., which might be said to be due entirely to the war. Still, he took no despondent view of things, and he thought he might congratulate the proprietors on the result of the year's working, notwithstanding the abnormal circumstances. The 524 million cubic feet of gas had been supplied through 17,789 meters—an increase of 419 meters in the year. To show that the gas that they had sent out was not used merely as an illuminant, which was really their principal work, he might say that no fewer than 12,120 gas-ovens were in use in the town, and upwards of 10,000 gas-fires. This would show that they had a considerable growth going on, though the quantity of gas consumed, owing to the war, had been reduced. These gas-fires were found to be very useful, and especially, he was told, the previous night, when a scare was experienced in the town. On an occasion like this they could be very useful in warming their rooms or cellars. (Laughter.) Sir Daniel gave some figures showing the ratio of the day to the night consumption of gas. In June, 1904, it was 49·6 per cent. of the total for 24 hours; whereas in June, 1914, it was 59·7 per cent. He thought this was a very satisfactory figure. After some remarks on the supply of coal and oil, the Chairman turned to the revenue account, the total of which showed a drop of £1676, which he did not regard as serious, taking all things into consideration. A new item in the balance-sheet was the co-partnership scheme, which had cost £801; and another was 100 guineas to the Mayor's Relief Fund. Twenty-eight of the Company's men, representing 13 per cent. of the whole of the employees, had joined the Colours; and he was happy to say that not one of them had been killed or injured. The report was adopted, and dividends at the full statutory rates, making 13½, 11, and 10½ per cent. per annum, were declared. After payment of these there would remain a balance of £13,290. Reference was made in the report to the change in the management consequent upon the retirement of Mr. J. T. Jolliffe, the Engineer and Manager; and his successor (Mr. Frank Prentice), in acknowledging a vote of thanks to the staff, said he was greatly indebted to them for their loyal co-operation. The Secretary (Mr. G. A. Mallett) replied on behalf of the office staff.

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A Medical Officer of Health on Modern Gas-Fires.

Writing in the "Sanitary Record" for last Saturday on "Gas-Fires: Ancient and Modern," a Medical Officer of Health said: "'Gas-fires are an abomination, an intolerable nuisance.' Such was the judgment of all sanitarians until quite recently, when something happened. It was a sane judgment too, for of all the air-driers and air-polluters the old gas-fire stood first. . . . But all this changed. Gas-fires may now be had which compare favourably with a coal-fire both from an economical and a sanitary point of view, especially the latter, when the smoke question is taken into account; for the dwelling-house chimney is not behind the factory chimney in its power to pollute clean air. The change from the old to the new is great—so great as to rescue the gas-fire from obscurity, and make it a splendid success. . . . I heard these fires boomed to such an extent that I became suspicious of the claims put forward. So I had one put in, and it has fully justified the claims made for its virtues. One thing I like about these new fires is the substantial outlet for any fumes which require to be carried away. The old arrangement, whereby a very small flue outlet was fixed, added greatly to the injurious effect produced by the fires. The new fires may be placed on an ordinary hearth, and if a flue-pipe is fixed up the open chimney for a distance of several feet, the fire will assist in the ventilation of the room just as a coal-fire does. In fact, it is claimed that some of the new fires will change the air in a room 'not only as often as scientific authority prescribes as essential to adequate ventilation, but actually 50 per cent. more.' Sanitarians may now recommend gas-fires, and feel much satisfaction in doing so."

Wakefield Gas Company.—In moving the adoption of the accounts at the annual meeting of the Company, the Chairman (Alderman G. A. Moorhouse, J.P.) said they had a satisfactory report, considering the abnormal circumstances caused by the war. The consumption of gas showed an increase of 4,328,600 cubic feet, or 1·44 per cent., and brought their sale of gas for the first time to over 300 millions—viz., 302,992,100 cubic feet. They had created a number of new records. The make and sale of gas per annum, the make and sale per ton of coal, the maximum day's sale, and the maximum week's sale, broke all previous records. The amount received for residuals was the one disappointing feature of the balance-sheet. This was down £1949, which was almost entirely due to the war. The meeting decided to pay the usual dividends of 6½ per cent. on the ordinary stock and 5 per cent. on the maximum stock, which would reduce the carry-forward by a considerable sum. Referring in the report to the death in November of the Chairman, Dr. W. A. Statter, J.P. (who had been a Director since 1892 and Chairman since 1896), the Directors said: "Dr. W. A. Statter, J.P., succeeded his father, the late Dr. William Statter, J.P., as Chairman; and as the latter was Chairman from 1847, they thus filled the chair between them for nearly seventy years, which the Directors think must be unique in the history of the industry."

Proposed Extensions at Tipton.—It was decided by the Tipton Urban District Council last Tuesday that drawings and specifications should be prepared showing proposed extensions of the gas-works to increase the capacity by 500,000 cubic feet per day. It was urged that this work should be undertaken as promptly as possible, in order to be ready for the next winter's demand.

Northwich Gas Company.—In moving the adoption of the report and balance-sheet at the annual meeting of the Company, Mr. C. T. Eachus stated that they had had a most successful year, and it was a source of gratification to find that, in face of large increases in cost of coal and other materials used on the works and district, together with a heavy decline in the market for residuals, there was an increased profit of £281, after having charged to revenue account £541 (suspended from the previous year) for renewal and repairs of plant. The gas-rental and residuals accounts had increased by £895 and £280 respectively. The amount of coal carbonized was 334 tons less than in the previous year; while the quantity of gas sold showed an increase of 5·28 per cent. The Chairman expressed satisfaction with the report, and congratulated the Manager, Mr. J. A. Brentnall, on his successful work. The report (which was unanimously adopted) recommended that dividends be paid at the rate of 4 per cent. per annum on the preference shares, and 11 per cent. on the ordinary shares—making 4 and 8½ per cent. respectively for the year.

Newmarket Gas Company.—The annual general meeting of this Company was held on Monday last week—Mr. R. Stephenson in the chair. The accounts presented showed a net balance of profit of £3751, and a sum of £7533 available for distribution. The Directors recommended the declaration of a dividend at the rate of 6¾ per cent. for the year on the original consolidated stock (less income-tax), absorbing £3738, and the carrying forward of the balance, £3795. In moving the adoption of the report, the Chairman said they had only earned just enough to pay their dividend, and had nothing to put by for a rainy day. But this was not to be wondered at, as last year was one of their "rainy days." Coal went up substantially, and all their residual products went down. He did not think they would quite earn the dividend next year; but he felt satisfied that they would be able to pay it by the aid of sums set aside in the past, without raising the price of gas. They had made a contract for the public lighting for the next ten years. The report was adopted. Replying to a vote of thanks accorded to him, the Manager and Secretary (Mr. J. H. Troughton) said it was gratifying to him to know, as he always had known, that he had the full confidence of the Directors, and also to learn that the shareholders appreciated the work he did. If a gas company could get through the present troublous times without increasing their price, it showed that the public were well served. He had a very good set of men in the yard and a very good staff, who all did their best in the interests of the Company. Under the profit-sharing scheme, the men had received practically £225 in two years, representing an advance of at least 5 per cent. on their wages; and this money had been saved by them. Of the whole of the men, 25 per cent. had gone to the war.

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Halesowen Gas Company.—The report submitted at the annual meeting of the Company showed that the net profit, after payment of interest on debenture bonds, was £2162, which, added to £1899 brought from the last account, made a total of £4061 available for distribution. The Directors recommended a dividend at the rate of 10¾ per cent. per annum on the "A" shares, and £7 10s. 6d. per cent. on the "B" shares, less income-tax; that £600 be carried to the renewals account; and that £2249 be taken to the next account.

A Bulk Supply from Tipton.—The question of an agreement between the Tipton Gas Committee and the Rowley Gas Company, for the supply by the former of gas to the Tividale area, came before the Tipton District Council at their meeting last Tuesday. It was agreed that Tipton should supply gas in bulk through a meter to be fixed by the Rowley Company on the Council's 8-inch gas-main in Tividale Road for lighting, cooking, and heating, at a flat-rate of 2s. 1d. per 1000 cubic feet. The consumption will be equal to a 6 per cent. increase on the Tipton sales.

Stone Gas-Works Purchase Question.—The Stone Gas Company have written to the Urban District Council, with respect to the proposed purchase of the gas undertaking by the Council, that the Directors had not engaged a valuer, and were not in a position to put a price on the undertaking; but if the Council were prepared to make an offer after the perusal of their own expert's report, the Directors would consider it. The Council discussed the matter in committee; and a resolution was adopted directing the Clerk to convene a special meeting of the General Purposes Committee to consider the matter.

Gas Tragedy at Southsea.—A sad tragedy was discovered on Friday morning at Southsea, by the landlady of rooms which had been taken on the previous day by a newly married couple. Becoming suspicious at their non-appearance, the landlady entered the bedroom and found the man dead, and the woman unconscious, from gas poisoning. Telegrams and other messages of congratulation on their wedding were found in the room. The gas supply was turned off at the meter overnight; but the tap of the gas-bracket in the bedroom had been left on, with the result that when the gas was turned on again at the meter early in the morning, it escaped into the room.

Prepayment Meters in Liverpool.—In the course of the proceedings at the meeting of the Liverpool Gas Company, reported elsewhere, reference was made by the Chairman, Mr. Wade Deacon, to the death of the former Treasurer of the Company, Mr. J. F. Robinson, whose death was recorded in the "JOURNAL" for the 16th ult.; and he mentioned that deceased was to a great extent responsible for introducing the penny-in-the-slot meter into the city. He recognized the risk run by many poor people in using oil-lamps, and he suggested that something might be done to provide a supply of gas automatically. The idea was taken up, with the result that the prepayment meter was introduced. As showing the extent to which this method of gas supply is used in Liverpool, it may be stated that upwards of £500 in coppers is collected daily. Liverpool was the first city in the country to adopt the system.

Dearer Gas and Lower Dividends at Littlehampton.—The report of the Directors of the Littlehampton Gas Company states that the quantity of gas sold during the year ended Dec. 31 was 64,120,000 cubic feet, or an increase of 1,753,000 feet over the previous year. The balance carried to the profit and loss account, however, was only £1742; and the Directors accordingly recommend dividends of 10, 7, and 5 per cent, on the "A," "B," and "C" shares respectively, as compared with 11½, 8½, and 5¾ per cent. paid in 1913. They also state that, in consequence of the very large increase in the cost of coal and all other materials used in the manufacture of gas, owing to the war, they are compelled to raise the price by 3d. per 1000 cubic feet, as from the 31st inst.

Uxbridge Gas Company.—In accordance with the reduction that had been made last spring in the price of gas, the Directors of the Company, at the recent meeting, recommended the payment of a dividend, less income-tax, for the first half of the year at the rate of £6 2s. 6d. per cent. per annum, and for the second half at the rate of £6 5s. per cent. per annum, making an average of £6 3s. 9d. per cent. for the year on the consolidated stock. This would absorb £8836, leaving a balance of £269 to carry forward. But for the war, the Chairman (Mr. H. E. Jones) told the shareholders, the figures would have been even better. They had increased the number of consumers to 9361, of whom no less than 6331 were coin-meter users. The working expenses had been materially reduced by the building of the new retort-house. As to the coal difficulty, there seemed to be more serious times in front of them; and they might have to raise the price of gas. But the Directors were determined not to do this until absolutely compelled. He added that 25 employees were taking their part in the war; and the Directors were seeing that their dependants were not suffering, and were keeping their jobs open for the men upon their return.

Additional Capital Sanctioned at Salisbury.—The Directors of the Salisbury Gas Company have, at an extraordinary meeting of shareholders, been authorized to raise the sum of £3000, by the issue of new ordinary 5 per cent. shares of £12 10s. each, in accordance with the powers of the Company. At the preceding general meeting, it was mentioned by the Chairman (Mr. George Fullford) that 25 per cent. of their regular staff were on active service; and he passed round for inspection a list of the names, which had been framed for a permanent record in the Board-room. The Directors had, he said, not been unmindful of the wives and families left behind. The inadequate railway service for the conveyance of coal had been their worst trouble. Frequently it had been a month in transit; and the quality for gas-works purposes had suffered considerably by exposure to weather. The chief feature of the accounts was the increase in the sale of gas. To meet this and immediate future demands, additional manufacturing plant was required at once. Too much praise could not be given to their Engineer and Manager (Mr. Norton H. Humphrys) for his care of their interests during a very trying crisis. He had been well supported by the staff, who were all entitled to recognition of their services.

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Decreased Lighting in Irish Towns.—Owing to coal shortage it has been found necessary to restrict the hours of street gas lighting in several Irish towns; and in some instances the local authorities have asked private consumers to economize as much as possible.

Mansfield Gas-Workers' Wages.—At the last meeting of the Mansfield Town Council, the Chairman of the Gas Committee (Mr. T. Smith) reported that an application had been made by the men for an increase of wages, which the Committee had determined to grant. Mr. J. P. Houfton referred to the moderate nature of the men's demands; stating that it was because they had been so reasonable in their request that the Committee felt bound to accede to it.

Matlock and District Gas Company.—The revenue account of the Company for the year ended Dec. 31, after providing for Directors' allowances, shows a profit of £3508, to which has to be added the unappropriated balance of £4925 from the previous year, making together £8433. An interim dividend and the debenture interest absorbed £1735; and this and the payment of a dividend for the last half of the year at the rate of 7s. per share on the paid-up capital of the Company, leaves a balance of £4804 to be carried forward.

Fatality at Saltley.—In returning a verdict of "Accidental death," at an inquest on the body of a shunter who was crushed at the Saltley works of the Birmingham Corporation, the Jury added an expression of opinion that there should be printed rules relating to signalling at the works. The driver of the shunting engine said he could not suggest how deceased got squeezed between the trucks. After witness had started, he received a signal to stop, which he did; and after waiting for a few moments, he started off again. Someone then shouted for him to stop; and on going behind he saw deceased on the ground injured. The Coroner said the man ought to be alive, and the driver was quite wrong in going on as he did after getting the signal.

Waltham Abbey and Cheshunt Gas Company.—The meeting of the Company, on Friday, was presided over by Mr. Alfred Kitt. The report for the year ended Dec. 31 showed a profit on revenue account of £4400; and the Directors recommended that dividends be paid for the past half year at the rate of 7½ per cent. per annum on the "A" shares and 5½ per cent. on the "B," "C," and "D" shares—making 8 and 6 per cent. for the year—less income-tax. The sale of gas had increased by 2·59 per cent., derived chiefly from automatic meters. The Chairman pointed out that the working for the twelve months resulted in an increase in the gross revenue of £24 over the previous year, in spite of the loss of business due to restricted lighting of outside shop-lamps. The Company joined with other companies in a petition against the London County Council Electricity Bill, which measure would not, however, be proceeded with.

Whitby Gas Company.—The annual meeting of the Company was (in the absence of the Chairman) presided over by Mr. R. Smailes, who referred to the serious loss sustained through the death of Mr. Alexander Allan, the late Deputy-Chairman. In considering the accounts for the past year, he said, it was scarcely possible to make comparison with previous years owing to the abnormal conditions prevailing since the outbreak of the war. With regard to the revenue account, the cost of manufacture was £153 less than in the previous year. New coal contracts were entered into at June at a saving on the previous contracts; and better results had been obtained owing to the introduction of modern carbonizing plant. The total expenditure was £7806, against £7756; while the receipts were down £263. A decrease in the gas sold was due to the shortening of the visiting season, and the enforced reduced lighting of business premises. The last half of the year had been a very anxious time for most gas companies; and taking the adverse conditions into consideration, the Directors hoped the results shown by the balance-sheet would be considered satisfactory. Seven of the Company's employees had joined the Colours, and allowances were being made to their dependants.

Worthing Gas Company.—The accounts adopted at the half-yearly meeting of the Company showed a balance of £23,468, out of which the Directors recommended a dividend at the rate of 5¼ per cent. per annum upon the consolidated ordinary stock. They reported that the construction of the new holder at Goring was nearing completion, and that the trunk mains to connect it with the works were being laid. To provide the necessary funds for meeting the expenditure which these works involve, a further £5000 of ordinary stock had been recently disposed of, at an average price of £95 3s. 3d. per £100. The Chairman (Mr. H. H. Gardner) remarked that, notwithstanding the reduction of 1d. per 1000 cubic feet in the price (equivalent to £400), the sales of gas showed a reduction of only £75 6s. Four members of the office staff and seventeen of the workmen had joined the forces. A shareholder, while expressing gratification at the extremely satisfactory report, commented on the difference between the quantity of gas manufactured and that accounted for, which amounted to over 10 per cent.; but the Manager (Mr. S. O. Stephenson) explained that this tendency to an increase in the proportion of gas unaccounted for was noticeable in other parts of the country, and possibly the increasing use of bye-passes might have something to do with it.

Mr. E. Davies, of the Hendon works of the Sunderland Gas Company, has been appointed General Foreman at the Keighley Corporation Gas-Works.

In view of the number of the staff and employees of the Redhill Gas Company who have joined His Majesty's Forces, it was felt by those necessarily remaining behind that an opportunity for practice with the rifle would be desirable. The Company readily gave permission for a range to be erected upon their property; and the Redhill Gas Company's Rifle Club was formed, with the Engineer (Mr. W. H. Bennett) as President, and Mr. Edwin Allison (Assistant Manager) as Chairman of Committee. The range is of the outdoor type, has four firing points, and is artificially lighted for night practice. The military now stationed in the town are using it regularly for firing practice.

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A series of lectures, with practical demonstrations, will be given every Friday (except Good Friday), at 3 p.m., until April 16, on "Cooking for the Sick and Convalescent," at the Queen's Gate Hall, Harrington Road, South Kensington, under the auspices of the Gas Light and Coke Company.

GAS COMPANIES IN THE STOCK EXCHANGE.

Business on the Stock Exchange last week was quieter than ever. The shrinkage has been going on gradually for some time past; and it has now reached a pitch which gives rise to serious disquietude among members. Impediments arising from the operation of internal regulations in regard to dealing, coupled with abstention on the part of the public who are peering forward into the future of fresh issues—not to speak of the formidable apparition of labour troubles—have in a great measure arrested operations. The situation of the railway companies between employees on the one side and the Government on the other weighed heavily on their special market and tended to depress the general tone. A good point was furnished by the big demand for the 20 millions of Treasury Bills, which were tendered for more than three times over at the best rates thus far attained; and at the close of the week a bright ray was shed by the receipt of war news of a gratifying, character. Business in gas securities, as in the rest, showed a considerable reduction. In fact, but for unusual activity in Primitiva preference it would have been very quiet indeed. Transactions in this issue were too numerous (and at prices varying only by a few pence) to chronicle in full. Suffice it to say, that they were all between $4\frac{1}{2}$ and $4\frac{3}{4}$.

Subject to this observation, the bargains done for cash during the week were as follows: On Monday, Continental Union $70\frac{1}{4}$, 71, Gas Light ordinary $91\frac{3}{4}$, ditto preference $91\frac{5}{8}$, ditto debenture $70\frac{1}{2}$, Oriental 110, 111, Primitiva preference $4\frac{1}{2}$ to $4\frac{15}{32}$, ditto debenture (1911) $74\frac{1}{2}$, 75, South Metropolitan $97\frac{1}{2}$, 98, Wandsworth "B" $124\frac{3}{8}$. On Tuesday, Brentford new 95, Gas Light ordinary 91, $91\frac{1}{4}$, $91\frac{1}{2}$, Primitiva preference $4\frac{5}{8}$, South Metropolitan 98. On Wednesday, Continental Union 71, Gas Light ordinary $91\frac{1}{2}$, Wandsworth "B" $124\frac{3}{8}$. On Thursday, Brentford new $98\frac{1}{2}$, 99, British $41\frac{7}{8}$, Gas Light ordinary 91, $91\frac{1}{2}$, ditto preference $91\frac{1}{2}$, Imperial Continental $82\frac{1}{4}$, $82\frac{3}{8}$, Primitiva preference $4\frac{1}{2}$ to $4\frac{11}{16}$, River Plate 84, South Suburban West Kent 93. On Friday, Bournemouth "A" $30\frac{3}{8}$, $30\frac{1}{2}$, British $41\frac{1}{4}$, $41\frac{3}{8}$, Gas Light debenture 71, $71\frac{1}{4}$, Primitiva $4\frac{3}{4}$, ditto preference $4\frac{1}{2}$ to $4\frac{3}{4}$, ditto debenture 90, South Metropolitan debenture $70\frac{1}{2}$, Wimbledon $117\frac{1}{2}$, 118. On Saturday, Commercial debenture $71\frac{1}{4}$, Gas Light ordinary $91\frac{5}{8}$, Tottenham "B" 112. Illustrating the value of local support to Provincial undertakings, on Wednesday Wolverhampton 10 per cent. fetched $204\frac{1}{2}$, and ditto 6 per cent. preference $124\frac{1}{2}$. In the Money Market, discount rates closed a shade firmer.

Bank rate (fixed Aug. 8) 5 per cent.; last year, 3 per cent.

LOWEST AND HIGHEST PRICES OF BARGAINS DONE FOR CASH IN THE WEEK ENDING FEBRUARY 27.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.		£ s. d.		
1,551,868	Stk.	April 8	$2\frac{1}{2}$	Alliance & Dublin Ord.	59–64	3 18 2	..
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76–79	5 1 3	..
280,000	5	April 29	$7\frac{1}{2}$	Bombay, Ltd.	$5\frac{1}{4}$–$6\frac{3}{8}$	5 17 8	..
50,000	10	Feb. 26	16	Bournemouth Gas and Water: 10 p.c.	29–30	5 6 8	$30\frac{3}{8}$–$30\frac{1}{2}$
373,480	10	,,	7	Bournemouth Gas and Water: B 7 p.c.	15–$15\frac{1}{2}$	4 10 4	..
95,000	10	,,	6	Bournemouth Gas and Water: Pref. 6 p.c.	$13\frac{1}{4}$–14	4 5 9	..
—	—	—	—	Bournemouth Gas and Water: Deb.	..	—	..
380,000	Stk.	Feb. 26	14	Brentford Consolidated	261–266	5 5 3	..
330,000	,,	,,	11	Do. New	204–209	5 5 3	95–99x
50,000	,,	,,	5	Do. 5 p.c. Pref.	109–111	4 10 1	..
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91–93	4 6 0	..
217,380	Stk.	Feb. 26	11	Brighton & Hove Orig.	208–213	5 3 4	..
344,200	,,	,,	8	Do. A Ord. Stk.	154–159	5 0 8	..
530,000	20	Mar. 26	$12\frac{1}{2}$	British	44–45	5 11 1	$44\frac{1}{4}$–$44\frac{7}{8}$
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88–90	4 8 11	..
345,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85–87	4 12 0	..
100,000	10	—	—	Cape Town & Dis., Ltd.	$1\frac{1}{4}$–$2\frac{1}{2}$	—	..
100,000	10	—	—	Do. $4\frac{1}{2}$ p.c. Pref.	4–6	—	..
100,000	Stk.	June 26	$4\frac{1}{2}$	Do. $4\frac{1}{2}$ p.c. Deb. Stk.	70–75	6 0 0	..
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	103–110	4 10 11	..
1,513,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106–108	5 1 2	..
560,000	,,	,,	$5\frac{1}{2}$	Do. $3\frac{1}{2}$ p.c. do.	103–105	5 1 6	..
475,000	,,	June 11	3	Do. 3 p.c. Deb. Stk.	$69\frac{1}{4}$–$71\frac{1}{2}$	4 3 11	$71\frac{1}{2}$
800 000	Stk.	,,	4	Continental Union, Ltd.	76–79	5 1 3	$70\frac{1}{2}$–71
300 000	,,	,,	7	Do. 7 p.c. Pref.	115–118	5 18 8	..
—	—	—	—	Croydon B and C 7 p.c.	..	—	..
492,270	Stk.	—	6	Derby Con. Stk.	123–125	4 16 0	..
55,000	,,	—	4	Do. Deb. Stk.	102–104	3 16 11	..
1,002,180	10	July 29	10	European, Ltd.	$17\frac{1}{4}$–18	5 11 1	..
16,362,910	Stk.	Feb. 12	4/17/4	Gas 4 p.c. Ord.	98–102	4 15 6	91–$91\frac{1}{2}$x
2,600,000	,,	,,	$3\frac{1}{2}$	Light $3\frac{1}{2}$ p.c. max.	76–79	4 8 7	..
4,062,235	,,	,,	4	and 4 p.c. Con. Pref.	96–99	4 0 10	$91\frac{1}{2}$–$91\frac{7}{8}$x
4,674,850	,,	June 11	3	Coke 3 p.c. Con. Deb.	$72\frac{1}{2}$–$74\frac{1}{2}$	4 0 6	$70\frac{1}{2}$–$71\frac{1}{2}$
258,740	Stk.	Mar. 12	5	Hastings & St. L. $3\frac{1}{2}$ p.c.	87–89	5 12 4	..
70,000	10	April 29	11	Hongkong & China, Ltd.	$16\frac{1}{4}$–$16\frac{3}{4}$	6 11 4	..
—	—	—	—	Hornsey 7 p.c.	..	—	..
131,000	Stk.	Mar. 12	$7\frac{1}{2}$†	Ilford A and C	151–154	5 2 4	..
65,780	,,	,,	$6\frac{2}{3}$†	Do. B	115–118	5 8 0	..
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92–94	4 5 1	..
4,940,000	Stk.	May 14	9	Imperial Continental	150–160	5 12 6	$82\frac{1}{4}$–$82\frac{3}{4}$
1,335,000	Stk.	Feb. 12	$3\frac{1}{2}$	Do. $3\frac{1}{2}$ p.c. Deb. Red.	84–86	4 1 5	..
200,242	Stk.	Mar. 12	$6\frac{1}{2}$	Lea Bridge Ord. 5 p.c.	119–121	5 7 6	..
551,000	Stk.	Feb. 26	10	Liverpool United A	211–213	4 13 11	..
718,100	,,	,,	7	Do. B	146–148	4 14 7	..
806,083	,,	June 26	4	Do. Deb. Stk.	97–99	4 0 10	..

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices. July 30.	Yield on Highest Closing Price.	Lowest and Highest Prices of Bargains.
£			p.c.		£ s. d.		
75,000	5	June 11	6	Malta & Mediterranean	$4\frac{1}{8}$–$4\frac{5}{8}$	6 9 9	..
250,000	100	April 1	$4\frac{1}{2}$	Met. of Melbourne: $4\frac{1}{2}$ p.c. Deb.	99–101	4 9 1	..
541,920	20	May 23	4	Monte Video, Ltd.	$11\frac{1}{2}$–12	6 13 4	..
1,775,892	Stk.	July 29	$4\frac{1}{2}$	Newc'tle&G'tesh'd Con.	$98\frac{1}{2}$–$99\frac{1}{2}$	4 10 6	..
529,705	Stk.	June 26	$3\frac{1}{2}$	Do $3\frac{1}{2}$ p.c. Deb.	$82\frac{1}{2}$–83	4 4 10	..
55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14–15	5 2 8	..
300,000	Stk.	May 14	8	Oriental, Ltd.	117–122	6 11 2	110–111
60,000	5	Mar. 26	10	Ottoman, Ltd.	$7\frac{1}{4}$–$7\frac{5}{8}$	6 9 0	..
60,000	50	Feb. 26	13	Portsea, Island B	128–131	4 19 8	..
100,000	50	,,	12	Do. C	118–121	4 19 2	..
249,980	5	April 29	8	Primitiva Ord.	$5\frac{1}{2}$–6	6 13 4	$4\frac{23}{32}$
499,960	5	June 26	5	,, 5 p.c. Pref.	$4\frac{1}{2}$–5	5 0 0	$4\frac{1}{2}$–$4\frac{3}{4}$
521,600	100	June 2	4	,, 4 p.c. Deb.	91–93	4 6 0	90
—	—	—	—	,, ,, ,, 1911	..	—	$74\frac{1}{2}$–75
346,193	Stk.	June 26	4	River Plate 4 p.c. Deb.	85–87	4 12 0	84
150,000	10	May 14	6	San Paulo: 6 p.c. Pref.	$10\frac{1}{2}$–11	5 9 1	..
125,000	50	July 1	5	San Paulo: 5 p.c. Deb.	47–49	5 2 0	..
135,000	Stk.	Mar. 12	10	Sheffield A	223–224	4 9 3	..
209,984	,,	,,	10	Do. B	222–224	4 9 3	..
523,500	,,	,,	10	Do. C	220–222	4 10 1	..
90,000	10	May 28	9	South African	$10\frac{1}{2}$–$11\frac{1}{2}$	7 16 6	..
6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	111–113	4 16 8	97–98x
1,295,445	,,	July 10	3	Do. 3 p.c. Deb.	$72\frac{1}{2}$–$74\frac{1}{2}$	4 0 6	$70\frac{1}{2}$
209,820	Stk.	Feb. 26	$8\frac{1}{2}$	South Shields Con. Stk.	157–159	5 6 11	..
952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116	5 3 5	..
60,000	,,	,,	5	Do. 5 p.c. Pref.	110–112	4 9 3	..
—	—	—	—	Do. West Kent.	..	—	93x
137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116–118	4 4 9	..
629,740	Stk.	May 14	5	Southampton Ord.	99–102	4 18 0	..
120,000	Stk.	Feb. 12	$7\frac{1}{2}$†	Tottenham District: A 5 p.c.	135–138	5 8 8	..
742,275	,,	,,	6†	Tottenham District: B $3\frac{1}{2}$ p.c.	115–117	5 2 7	112x
181,255	,,	June 26	4	Tottenham District: 4 p.c. Deb.	87–89	4 9 11	..
182,380	10	Dec. 30	5	Tuscan, Ltd.	5–5	8 6 8	..
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93–95	5 5 8	..
236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	$103\frac{1}{2}$–$109\frac{1}{2}$	4 11 4	..
30,000	Stk.	Feb. 26	$8\frac{3}{4}$	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151–153	5 7 4	..
255,636	,,	,,	$6\frac{1}{2}$	,, B $3\frac{1}{2}$ p.c.	129–134	5 2 7	$124\frac{1}{2}$
108,075	,,	,,	5/17/3	,, C $3\frac{1}{2}$ p.c.	110–115	5 2 0	..
352,000	,,	,,	$6\frac{1}{2}$	Wimbledon 5 p.c.	117–122	5 0 5	$117\frac{1}{2}$–118
98,000	,,	,,	$6\frac{3}{4}$	Epsom 5 p.c.	121–126	5 5 2	..
88,416	,,	June 26	3	3 p.c. Deb. Stk.	66–69	4 6 11	..

x Bargains marked thus were "Ex Div."

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

ENGINEER AND MANAGER. Mossley Gas Committee. Applications by March 8.
GAS-WORKS MANAGER. Neath Corporation. Applications by March 16.
CHEMIST (Mantle Factory.) No. 5999.
DRAUGHTSMAN. West's Gas Improvement Company, Manchester.
JUNIOR DRAUGHTSMAN. Cockey's, Frome.
JUNIOR DRAUGHTSMAN. No. 6001.
PREPAYMENT METER COLLECTOR. Aldershot Gas, &c., Company.
FOREMAN FITTER. Sunderland Gas Company. Applications by March 8.
BLACKSMITH FITTER. No. 6000.
LABOURERS. Aldershot Gas, &c., Company.
STOKER. No. 6002.

Gas-Works Wanted.

Particulars to "PRINCIPAL," Scripps's Advertising Offices, 13, South Molton Street.

Plant, &c. (Second-Hand), for Sale.

GASHOLDER AND TANK. Rayne and Burn, Newcastle-on-Tyne.
SULPHATE PLANT. Normanton Gas-Works.
WASHER AND STEAM-ENGINE, &c. Blyth Gas-Works.

Sales of Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. London Mart. March 9.
CROYDON GAS COMPANY. Tenders by March 23.
FELIXSTOWE AND WALTON WATER COMPANY. London Mart. March 9.
SOUTHGATE GAS COMPANY. London Mart. March 23.
TENDRING HUNDRED WATER COMPANY. London Mart. March 23.

TENDERS FOR

Elevator and Coke Screening Plant.

WALLASEY CORPORATION. Tenders by March 18.

Fire-Clay Goods.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by March 10.

General Stores (Oils, Paints, Tools, &c.).

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by March 10.

Pipes, &c.

HEBDEN BRIDGE AND MYTHOLMROYD GAS BOARD. Tenders by March 10.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 171, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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GAS LIGHTING ENGINEERS AND CONTRACTORS.
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SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED.
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Address Correspondence and Inquiries to OLDBURY WORKS.
Telegrams: "CHEMICALS, OLDBURY."

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.
RETORT SETTINGS, COAL TESTING PLANT BOILER FIRING.
Communications should be addressed to UNDERWOOD HOUSE, PAISLEY.

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SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.,
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Telephone: 1588 AVENUE (3 lines).

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JOSEPH A. HUTCHISON, LIMITED,
HIGHBRIDGE WHARF, SOMERSET.

TAR WANTED.
THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works,
NORTON STREET, MILES PLATTING, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Lysol, Sulphate of Ammonia.

PATENTS AND TRADE MARKS
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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
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CARBURINE FOR GAS ENRICHING
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THE MAXIM PATENT CARBURETTOR.
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SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 16, p. 364.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEEDS.

TAR WANTED.
THE Burnden Tar Company (Bolton), Ld.
HULTON CHEMICAL WORKS, BOLTON.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the Enrichment of Gas.
Manufactured and Supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agents, F. J. NICOL & Co., Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE AND CO., Chemists and Engineers, Palace Chambers, WESTMINSTER, S.W.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
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GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the best. Satisfaction Guaranteed.

KEIGHLEY CORPORATION.
(GAS DEPARTMENT.)

APPLICANTS for the Post of Works FOREMAN are THANKED, and informed that THE VACANCY HAS BEEN FILLED.
W. BAILLIE,
Engineer.
Feb. 24, 1915.

OXIDE OF IRON.
We are in a position to Supply Oxide of Iron promptly, and invite Enquiries.
SPENT OXIDE WANTED.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

"TORTO" FIRE CEMENT.
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Tins for sale to Consumers.
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BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

J. F. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

NEATH CORPORATION.
GAS-WORKS MANAGER.

APPLICATIONS are invited for the Position of GAS MANAGER, with Practical Experience in the Manufacture of Gas and the Extension of Mains, &c. The person Appointed to devote the Whole of his Time to the Duties (a list of which may be obtained by intending Candidates on Application to the Town Clerk) and to Live upon Premises provided by the Corporation adjacent to the Gas-Works.
Salary £200 per Annum, payable quarterly, with House, Coal, and Gas Free. Three Months' Notice on either side to terminate the engagement.
Applications, endorsed "Gas Manager," stating Qualifications, Age, and Experience, and accompanied by three recent Testimonials, to be sent to the Town Clerk not later than the 16th of March.
Canvassing, directly or indirectly, is strictly prohibited, and will be regarded as a disqualification.
EDWIN C. CURTIS,
Town Clerk.
Neath, Feb. 23, 1915.

BOROUGH OF MOSSLEY.

THE Gas Committee are prepared to receive Applications for the Position of GAS ENGINEER AND MANAGER.
Salary, £250 per Annum, with Annual Increases of £10 to a Maximum of £300 per Annum, with House, Coal, and Gas in addition.
Applications, endorsed "Gas Manager," must be sent to the Chairman (Mr. Alderman Lees), not later than the 8th of March next.
Canvassing, either directly or through friends or otherwise, will disqualify any Candidate.
JOSEPH HYDE,
Town Clerk.

WANTED, for British Gas-Mantle Factory, a CHEMIST with previous Experience of Gas-Mantles. One with knowledge of Treatment of Monazite Sand preferred.
Apply, by letter, stating Age, References, and Experience, to No. 5999, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMAN wanted, Mechanical and Structural Experience.
Apply, giving all Particulars, with Age and Salary required, to WEST'S GAS IMPROVEMENT COMPANY, LIMITED, Albion Iron-Works, Miles Platting, MANCHESTER.

WANTED—Junior Draughtsman well up in Gas-Works Plant.
Apply, stating Wage required, to Cockey's, Frome.

JUNIOR Draughtsman required for a London Suburban Gas-Works. One having had Experience in a Gas-Works or a Gas-Works Contractors' Drawing Office preferred. Salary, £80 per Annum.
Apply, by letter, with recent Testimonials, to No. 6001, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C.